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Devoted to an explanation of the procedures used to analyze jobs and to record the analyses using the format of the Job Analysis Schedule of the U.S. Employment Service, this manual may be used in formal training courses or for self-training in job analysis. The categories necessary for a complete analysis of a job are what the worker does, how he does it, why he does it, and the skill involved in doing it. This information is used in such activities as recruitment and placement, vocational counseling, job and employee evaluation, training, and labor relations. The job analysis schedule is divided into informational areas of (1) identification data, (2) work performed, (3) sources of workers, (4) performance requirements, (5) comments, and (6) physical demands. A description of items within each informational area includes a discussion of procedures and methods used to secure detailed, valid, and authoritative occupational information. A narrative report accompanies the analysis schedule and offers the analyst an opportunity to present such information as purpose of the plant, plant environment factors, plant placement policies, and plant organization. Examples of completed job analysis forms are given in the appendixes. (HC)

ED0 24769

TRAINING & REFERENCE MANUAL FOR

JOB ANALYSIS

U.S. DEPARTMENT OF LABOR
W. Willard Wirtz, Secretary
MANPOWER ADMINISTRATION
Bureau of Employment Security
WASHINGTON, D.C. 20210

MAY 1965
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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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TRAINING & REFERENCE MANUAL FOR JOB ANALYSIS

BUREAU OF EMPLOYMENT SECURITY
Robert C. Goodwin, Administrator
U.S. EMPLOYMENT SERVICE
Louis Levine, Director

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FOREWORD

President Johnson, in his "1964 Manpower Report to the Congress," stressed the importance of occupational information, stating that "current and prospective shortages of needed skills must be better identified if we are to prevent any drag on our economic growth—and to help in providing young people and displaced workers with the education and training needed to benefit from opportunities in expanding fields." He further stated that "manpower policy must be geared to three fundamental goals: (1) To develop the abilities of our people, (2) to create jobs to make the most of those abilities, and (3) to link the first two, to match people and jobs."

Since 1944, the Bureau's Training and Reference Manual for Job Analysis has served as a basic guide for occupational analysts and other personnel workers, both nationally and internationally, who are concerned with the techniques and procedures for collecting source data which are fundamental to the development of occupational information tools for use in the effective placement of workers. Over the years, and especially with the passage of such legislation as the Area Redevelopment Act, the Manpower Development and Training Act, and the Economic Opportunity Act of 1964, there has been an increasing need for basic occupational data. Also, the present interest in occupations caused by the problems resulting from rapid technological changes has created a demand for the identification and study of the skills of obsolescent, changing, and emerging jobs affecting the composition of our labor force. Therefore, this document has been revised to serve not only the day-to-day operations of the State employment security agencies but also to implement the many new manpower programs. Some changes have been made, but basically the document remains the same as it was when first issued. This may be considered an interim revision pending preparation of a new manual based on recent developments in job analysis.

This revision was prepared in the Branch of Occupational Analysis, Leon Lewis, Chief, by Arden Nelsen, Ronald Westfall, and former staff members. Recognition should be given to all the analysts associated with the occupational research program of the U.S. Employment Service who, since the inception of the program, contributed out of their experiences and knowledge to the development and preparation of this manual.

Acknowledgment also must be made to the State employment security agencies, other government agencies, professional societies, labor unions, trade associations, industrial and business firms, and other groups and individuals who cooperated with and assisted our analysts. Included in this group are the thousands of organizations throughout the country in which analysts observed jobs and conferred with foremen and management and industrial relations personnel. The technical advice and assistance thus obtained have contributed to the refinement of the procedures contained in this document.

LOUIS LEVINE,
Director, U.S. Employment Service.

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SUGGESTIONS FOR STUDYING THE MANUAL

This manual should be introduced in a planned, formal training course. However, since such training is not always possible, there are outlined below procedures which should be followed by the analyst seeking to train himself in the principles and methods involved. The analyst should remember that the manual is intended primarily as a reference, and the material is organized with that in mind.

Procedures for Self-Training

1. The analyst should first read those parts of the manual which describe the purpose of job analysis and the use of the information thus obtained. See chapters on "Job Analysis in the U.S. Employment Service" and "Uses of Job Analysis."

2. Following this, he should study the definition of the word "job" contained in the chapter "Principles in the Analysis of Jobs". In this respect, the analyst should find a few other definitions of the same word and compare them, noting similarities and differences. Once he understands the meaning of a "job" as used in the manual, he should study the meaning of the term "job analysis."

3. Before proceeding further, the analyst should familiarize himself with one job that can be used in the practice work to follow. The analyst should not attempt to analyze the job at this time. Rather, he should find out all he can about the job and write down his findings in simple, narrative fashion.

4. When he is sure he understands the job thoroughly, he should turn to the "Work Performed" section, page 12. After he has studied the instructions, he should write a Work Performed for the job in correct form. He should then verify that each work element answers the questions "What," "How," and "Why."

5. Following this, the analyst should study the "Performance Requirements" section, page 20, as a whole and then review the Performance Requirements one by one. When he has completed the review of each requirement, he should write that performance requirement for the practice job he has chosen. He should not proceed to the next requirement until he is sure the preceding one is complete and understandable.

6. Finally, the analyst should study the "Comments" section, page 27. He should complete his practice by filling in this section.

When the practice job analysis schedule is complete, the portions of the manual covered should be reviewed and the schedule should be examined critically. Necessary changes in the schedule should be made to conform to manual instructions. The analyst also should examine the schedule for omissions which should be filled in to gain a complete picture of the job. It would be advantageous for the analyst then to select another job and analyze it completely, proceeding straight through the report form. The second schedule should be reviewed critically as before.

When he believes he can analyze a job in the prescribed form, the analyst should study the subsequent sections of the manual which deal with the methods of making analyses in plants.

In this connection, it would be helpful if he obtained an industrial organization chart, preferably of a large organization, and studied its departmental plan. He should then plan a study of the plant, selecting the order in which the departments should be covered on the basis of jobs likely to be found in each department.

I

JOB ANALYSIS IN THE U.S. EMPLOYMENT SERVICE

This manual is devoted primarily to an explanation of the procedures used to analyze jobs and to record the analyses, using the format of the Job Analysis Schedule of the U.S. Employment Service as a guide. The ideas presented here do not differ fundamentally from other established job analysis procedures. Rather, they are an expansion of those procedures to secure concrete and specific information on the more intangible aspects of jobs. The procedures have been designed to secure precise and discriminating job information which should meet the needs of most job analysis programs.

The manual is constructed around the schedule form which was designed specifically to meet the needs of the several phases of the Employment Service's program of occupational information. It should be made clear, however, that the schedule does not analyze the job; it is but the form on which the analysis is recorded. The application of the concepts on which procedures are based constitutes the analysis of the job. The job analysis concepts employed by the U.S. Employment Service are sufficiently universal in nature to be applied to any program of job analysis, regardless of the format used to record the results of analysis.

When analyzing jobs, the analyst must remember that the job analysis schedule is only a guide on which job information may be recorded uniformly. The items included in the schedule will usually be adequate to cover most types of jobs encountered. Similarly, the discussion concerning each of the items will be found sufficiently complete to guide the analyst in recording the pertinent details of most jobs. Occasionally, however, jobs may be encountered which cannot be handled adequately by the usual procedure. Also, all jobs may not include every item indicated on the schedule. For these reasons, the analyst must not consider the schedule and the manual as arbitrary and inflexible.

The basic purpose of the schedule is to present a concise and complete picture of all tangible and intangible factors involved in a job. To assure the attainment of this objective, the analyst must never attempt to adapt the job to the schedule. Rather, he should feel free to make comments, notes, or explanations necessary to overcome any limitations the schedule may have with respect to the pertinent details of a particular job. Also, he should feel free to depart from the methods and procedures of the manual if he deems it necessary in the interest of clarity or efficiency, or if the specific purpose for making the analysis is not reflected adequately through the application of manual methods and procedures. He must be certain, however, that any departure will contribute to the quality of the schedule.

The job analysis schedule serves as the basic source material for many of the products of the U.S. Employment Service. The schedule, therefore, must be complete in all its details. It must contain enough information about the job tasks so that a definition can be written for the *Dictionary of Occupational Titles*. It also must contain complete information concerning the skills, knowledges, abilities, and responsibilities required of the worker by the job so that the job can be classified accurately within the code structure of the *Dictionary of Occupational Titles*. Schedule data are required for Dictionary definitions concerning jobs for which no experience is required, the so-called "entry jobs." These data assist in establishing methods for evaluating occupationally significant information about inexperienced job applicants, and provide the basis for reflecting such data in the code structure of the Dictionary.

In developing and applying trade tests, job analysis, through the schedule, identifies the major job tasks in which proficiency should be measured and serves as a basis for selecting the appropriate test to administer to applicants claiming specific experience. In developing and applying aptitude tests, job analysis provides the basis for selecting tests that will measure the aptitudes required for successful performance on the job. Job analysis also aids in comparing a job to be filled against a job for which tests have been standardized in order to select the appropriate test to administer to applicants.

In dealing with the suitability of jobs for special groups of workers, such as the physically handicapped and older workers, schedules provide surveys of the physical demands of jobs. The information thus obtained is reported in such a manner that all personnel concerned with placing and utilizing such workers can recommend most accurately the jobs in which they should be employed.

Job families require that job analysis schedules contain complete information concerning job tasks and their level of relative difficulty, as well as comprehensive information on such considerations as intraplant relationships. This information is extremely important in relating jobs in terms of basic similarities.

Job analysis schedules form the major foundation for all job descriptions. Although arranged differently, the sections of the one are nearly coincidental with the sections of the other. The approach to job descriptions, however, is naturally from the angle of usefulness in recruitment, placement, counseling, and utilization operations rather than from the approach of reporting only facts, which is the main objective of the schedule.

The responsibility for preparing complete, clear, and concise job analysis schedules rests mainly with the analyst. It is not possible for his supervisor, or the staff in the Bureau's national office, to reanalyze all jobs as a check on those which he has covered. If the analyst obtains all information and records it in the manner explained in this manual, acceptable schedules will result.

The U.S. Employment Service tested these methods and procedures in actual operations and established their value and practicability prior to their release. The proper utilization of the concepts herein presented should make possible the preparation of job analyses of consistently high quality and of maximum value in the preparation of all occupational information materials.

II

USES OF JOB ANALYSIS

Information concerning jobs is the basic material used by industry, governmental and private agencies, and employee organizations for many programs ranging from broad types of activities, such as personnel management and placement, to specific ones, such as defining the limits of authority. The nature of the job information required varies in type and approach according to program needs. Regardless of the ultimate use for which it is intended, however, the information must be accurate, must omit nothing pertinent to the program, and must be presented in a form most suitable for study and use. The techniques of securing and presenting this information are known as "job analysis."

In other words, job analysis is defined as the process of identifying, by observation, interview, and study, and of reporting the significant worker activities and requirements and the technical and environmental facts of a specific job. It is the identification of the tasks which comprise the job and of the skills, knowledges, abilities, and responsibilities that are required of the worker for successful performance and that differentiate the job from all others.

Before the analyst can comprehend fully the meaning and implications of this definition, he must know exactly the reasons for the job analysis and the fundamental information which he must obtain.

Basically, there are but three parts to the analysis of any job: (1) The job must be identified completely and accurately; (2) the tasks of the job must be described completely and accurately; (3) the requirements the job makes upon the worker for successful performance must be indicated.

Any additions to these three are for the purpose of specific programs and have specific uses. Under any conditions the second of these three parts is outstandingly important—the complete and accurate describing of the job tasks. Without this the rest of the analysis lacks meaning.

The categories of information that must be obtained and reported in order to meet the requirements for a complete analysis of a job are four in number and have been formalized into a measurement device that is designated as the "Job Analysis Formula." These four categories are: "What the worker does," "How he does it," "Why he does it," and "The skill involved in doing."

Before a job analysis can be of value in any program, it must indicate the exact nature and scope of the tasks involved in a job and define the level of difficulty of those tasks. The first three parts of the Job Analysis Formula, the "What," "How," and "Why," bring out the nature and scope of the tasks. The last part of the formula, the "Skill Involved," measures the degree of difficulty of the tasks and exactly defines the nature of the required skills in order to indicate their difficulty. The Job Analysis Formula will be discussed in greater detail later in the manual.

To understand why the information represented by the Job Analysis Formula must be present in every analysis, the analyst should be acquainted with some of the many uses of job analysis. Job analyses and their byproducts—job descriptions, job specifications, occupational classification structures, wage evaluation systems, and the like—are systematic methods indispensable for thoroughness and accuracy in personnel management, industrial relations, labor utilization, and related activities. Some 20-odd uses of job analysis have been clearly identified. Important among these are:

Recruitment and Placement

Job analysis is used to identify job requirements and the specific qualities required of workers to fill jobs. Recruitment and placement officers, both in industrial personnel offices and in the public employment service, thus can be guided in bringing together the worker and the job. Without information revealed in job analysis products, such as the *Dictionary of Occupational Titles*, job descriptions, and interviewing aids, intelligent interviewing is difficult and accurate placement, a matter of chance. Detailed information about jobs places recruitment and placement on an objective basis.

Vocational Counseling

The products of job analysis furnish the vocational counselor with accurate pictures of the tasks and requirements of jobs and of the avocations, training, and experiences that lead to them. If occupational adjustment is to continue to be a significant factor in the solution of worker problems, the counselor must be provided with accurate and adequate information about jobs on which he can base his advice to workers, especially youth, the physically and mentally handicapped, and the inexperienced. Such information can come only through job analysis.

Job and Employee Evaluation

Job analysis provides the occupational data required for developing an objective method for evaluating employee performance on the job. It permits relating the qualifications and abilities demonstrated by the worker to occupational factors and demands in order to show properly employee performance. Lacking such objective measures, the rating official is reduced to mere guess in determining the degree of skill possessed by a worker. Similarly, jobs must be evaluated objectively in order to assure equitable salary and wage rates and to maintain orderly and economic operation. Objective evaluation of jobs requires careful analyses of the relative degrees of skill or difficulty of the jobs. Job analysis alone can supply the data needed.

Training

A successful training program is dependent, in part, upon detailed information regarding the involved jobs. Workers cannot be trained adequately unless the nature, duties, responsibilities, and like factors of the jobs for which they are being trained are known. The content of the training curriculum, time required for training, and selection of trainees are dependent upon thorough analyses of the jobs.

Better Utilization of Workers

Job analysis is of primary importance in industrial management. By supplying complete information on the nature of all the jobs in a plant, it provides the basis for establishing efficient organization plans. Job analysis also provides the basis for job reengineering by giving clear and concise pictures of individual jobs and pointing out the reallocation of tasks for more efficient production. Also, it indicates where methods can be reengineered to utilize existing personnel more fully by exposing faulty work procedures or duplication of effort.

Safety, Health, and Medical Research

Safety engineering utilizes job analysis to locate potential sources of occupational hazards and to develop safety procedures for eliminating the hazards. Here, as in other fields in which job analysis is used, an analysis of causative conditions is fundamental to remedial action. Occupational diseases and fatigue can be traced to the nature of the job and its surroundings.

Similarly, occupational data regarding physical requirements provide medical departments with information required to decide whether or not a disabled employee or a person possessing physical limitations can perform the duties of a job. In addition, knowledge of the nature of tasks is essential to determine their suitability for occupational therapy and related needs.

Labor Relations; Within-Plant Personnel Policies

Clear statements of duties and responsibilities of all jobs in an organization result from job analysis. Such statements are the factual bases upon which workers and managment can achieve a common understanding. They assist in adjusting grievances arising from such factors as performance and responsibility, and they define the limits of authority essential to productive working relationships. They define and outline promotional steps and thereby become factors essential to good morale.

Under these broad general programs are many specific applications of job analysis, such as the determination of the content of vocational courses, determination of occupations suitable for women, and the determination of limits of authority. From an examination of any of them, it is apparent that their success is dependent largely upon the completeness and accuracy of the facts with which they deal, many of which are obtained only by job analysis. To assure this, the task of the job analyst is to get the facts, get them accurately, and get them all.

III

PRINCIPLES IN THE ANALYSIS OF JOBS

As considered in this manual, job analysis is defined as the process of determining, by observation, interview, and study, and of reporting the significant worker activities and requirements and the technical and environmental factors of a specific job. It is the identification of the tasks which comprise the job and of the skills, knowledges, abilities, and responsibilities required of the worker for successful job performance. However, before the analyst can fully comprehend the meaning and implications of this definition and before he can start the actual analysis, he must know exactly what is meant by the term "job."

The term "job" is used in many different ways and has different meanings to the individuals using the term. Because such terms as "job," "position," "task," and "duty" are so often used interchangeably, and with resulting confusion, it is necessary to establish somewhat arbitrary meanings for them for the purpose of this manual and job analysis in the U.S. Employment Service. The following terms are significant for an understanding of basic job structure and job analysis:

1. ELEMENT is the smallest step into which it is practicable to subdivide any work activity without analyzing separate motions, movements, and mental processes involved. It is a work unit that describes in detail the methods, procedures, and techniques involved in a portion of a job.

2. TASK or DUTY, made up of one or more elements, is one of the distinct major activities that constitute logical and necessary steps in the work performed by the worker. It is the work unit that deals with the methods, procedures, and techniques (the "What," "How," and "Why") by which parts of a job are carried out. A task or duty is created whenever human effort, in terms of one or more elements, must be exerted for a specific purpose. The effort may be physical, as pulling and lifting, or mental, as planning and explaining. The effort may be exerted to change a material or merely to maintain the status quo of a material. The material may be tangible, as boards and nails, or intangible, as numbers and words. Each task or duty has certain distinguishing characteristics.

(*a*) It is recognized, usually, as being one of the worker's principal responsibilities.

(*b*) It occupies a significant portion of the worker's work time.

(*c*) It involves work operations which utilize closely related skills, knowledges, and abilities.

(*d*) It is performed for some purpose, by some method, according to some standard with respect to speed, accuracy, quality, or quantity. This standard may be provided by the worker himself through trial and error or as a result of experience; it may be furnished to the worker by his supervisor in the form of oral, written, or graphic instruction; or it may exist in the form of directives, published operating procedures, or similar media.

Tasks or duties may be considered major or minor, depending on the extent to which they establish demands for skills, knowledges, aptitudes, physical capacities, and personal traits and upon the percentage of total work time involved in their performance.

3. POSITION is an aggregation of tasks or duties with related responsibilities. Each position has characteristics which distinguish it and by which it may be recognized.

(*a*) It has a definite scope and purpose.

(*b*) It requires the full-time service of one worker.

(*c*) It involves work which utilizes related skills, knowledges, and abilities.

4. JOB may be defined as a group of positions which are identical with respect to their major or significant tasks and sufficiently alike to justify their being covered by a single analysis.

The first step in the analysis of jobs is an exact determination of what the jobs are and their precise limits; that is, where the jobs begin and where they end. The analyst therefore must be able to analyze a group of positions, determine the number of basic units or jobs existing among the positions, and then discover the exact nature of those jobs. To state this more concretely, he must have the ability to go into a department or other organizational unit of a plant and determine the exact number, nature, and relationships of the jobs in that department.

As an illustration, suppose that an establishment employs 10 workers who operate engine lathes. Each of these workers occupies a position. There may be some differences among the 10 positions with respect to the operations performed, the metals worked on and the type of machine setup required. Nevertheless, since all 10 workers are operating the same kind of machine in performing metal-cutting operations of a comparable difficulty, the analyst can readily determine, on the basis of the foregoing discussion of terms, that these 10 positions are identical with respect to major tasks and therefore constitute one job. On the other hand, suppose that half of the 10 workers set up their own machines and do complex work, while the other half have their machines set up for them and are limited to routine work requiring little skill in machine operation. In this instance there would be not one job but two, one for the all-around operators and one for the lesser skilled operators.

Jobs should be analyzed as they exist, each completed job analysis schedule describing one job as currently found in the particular organization being studied. Therefore, each job schedule must faithfully report the job exactly as it exists at the time of the analysis, not as it should exist, not as it has existed in the past, and not as it exists in similar plants. While jobs are, to a certain extent, constantly changing, the analyst should not speculate on future plans given by employers or on how the analyst believes the job might change in the future. Such tactics would defeat the ultimate purpose of the study—that of informing employment personnel and similar groups of the nature of jobs that presently exist in the country.

Basically, every job analysis should represent a description of one job as defined above—no more and no less. However, some variations are occasionally necessary. Tasks temporarily assigned to a given worker who is hired to perform other tasks most of the time must not be confused with a job in the sense that the term is used here. One job analysis should be written for such a worker and it should be explained that the worker is assigned to certain combinations of these tasks from time to time. In considering the tasks that normally constitute jobs, three general situations may occur:

1. Where workers are interchangeable and frequently change from one set of tasks to another. The situation which follows illustrates the manner in which this might occur. Four workers, known as Mashing Hands, were found performing a set of duties which included weighing out specified amounts of loose tobacco; packing the weighed tobacco into shape boxes in which the tobacco was compressed into cakes in the mashing machine; taking shape boxes from the mashing machine and removing the cakes of pressed tobacco from the shape boxes; and cutting the tobacco cakes into large squares. The workers frequently changed about to relieve monotony. The tasks should ordinarily be analyzed collectively and recorded on one job analysis schedule, since the simple tasks involved, although performed by individual workers, actually constitute one job, all phases of which are performed by all the workers.

2. Where workers are interchangeable but are more or less permanently assigned to one group of tasks. As an example, there was in an aircraft factory a group of workers who were known as Fuselage Frame Builders, Rib Frame Builders, and Spar Builders. The workers were engaged in framework assembly in jigs of various members of unit fuselages, wing ribs, or wing spars, and temporarily were securing the assemblies with screws, bolts, or tack welds prior to final riveting or welding operations. Although the jobs were interchangeable to the extent that any one of the workers performed the duties of any one of the others in emergencies, each worker performed his respective job in regular production work. Situations such as these should be considered separate jobs, and the analyses should be recorded on separate job analysis schedules.

3. Where workers are not interchangeable. For example, the duties of the jobs of an Aeronautical Engineer and a Patternmaker are so dissimilar and unrelated that the workers are not considered transferable or interchangeable. They are separate jobs and should be reported on separate job analysis schedules.

If there is any doubt as to whether the situation under consideration falls under example 1 or example 2 above, it is better to prepare separate schedules, since this procedure usually gives more complete information and facilitates the subsequent classification of schedules for processing. In such cases suitable comments should be added to the analysis to clarify the relationships of the jobs.

IV

THE JOB ANALYSIS SCHEDULE

PART I

IDENTIFICATION DATA

Items 1 through 10 of the schedule form identify a job accurately within the organization in which it occurs. Spaces are provided for entering the job title, type of establishment in which the job occurs, number of workers employed on the job, and other similar information. This identification is necessary to permit a rapid reference to schedules which contain desired information. It is so presented that it permits the ready locating in files either of the schedule or of informational products developed from the schedule.

Item 1

Job Title

Enter the name by which the job is commonly called in the establishment being analyzed. This title should be the one that the employer would use in requesting referral of an applicant, or one which the workers use among themselves in referring to the job. All plant job titles should be written in capitals, in the singular, and in their natural form exactly as the plant writes them.

If the plant title appears to be inappropriate or is not descriptive of the job, the analyst should qualify it with a word or phrase in parentheses after the title to make it as precise as possible, as: OPERATOR (SHIRT NECKBAND). No portion of the job title as given by the establishment should appear in parentheses, and no portion of the analyst's additions or modifications of it should appear outside the parentheses.

The analyst is concerned primarily with reporting facts about jobs in the establishment in which the analysis is being made, but if he knows that there is something unusual concerning the use of a particular title, or if the title is so general as to be meaningless, he should use the title and fully explain the circumstances in the "Comments" section of the schedule and, where necessary, should suggest appropriate titles.

Under no circumstances should the analyst devise and insert in item 1 a title of his own. The title must be that used by the employer in referring to the worker or by the worker in referring to the job, no matter how inappropriate it may seem.

Item 2

Job Analysis Schedule Number

Each job analysis schedule is assigned a different number. The number is seven digits or more in length. The first two will always be the State identification number (see app. IV for numbers assigned to State agencies). The schedule number will appear on each page of the job analysis schedule.

Example: State agency "A" is assigned 99 as its identification number; the 1st schedule prepared would be assigned 9900001; the 12th, 9900012; the 135th, 9900135, etc.

The numbering of job analysis schedules for the second establishment in which studies are conducted should begin wherever the numbering ended with the first establishment's analyses.

> Example: State agency "A" prepared 135 job analysis schedules in the first establishment in which studies were conducted. The job analysis schedules were numbered from 9900001 through 9900135. Numbering of schedules for the second establishment in which analyses are made should start with 9900136.

If studies are being made simultaneously in two or more establishments, it is usually convenient to assign a block of schedule numbers to one establishment and another block of numbers to the second establishment. Any unused numbers in a block may be assigned to miscellaneous schedules or may remain unused. Similarly, it may be convenient to assign larger blocks of numbers for the use of analysts located in widely separated areas of the State.

Item 3

Number Employed

Insert here the number of workers of each sex that, at the time of the analysis, are employed on the job being analyzed. If the number employed varies appreciably from time to time, a notation of the range (after the number currently employed) should be indicated in parentheses. Also, if the workers employed are divided among shifts or if they are divided among two or more departments, a notation regarding such situations should be made in the "Comments" section.

Item 4

Establishment Number

Each establishment (plant, agency, association) in which analyses are conducted is to be assigned an identification number by the State agency making the study.

The establishment number, consisting of three parts separated by hyphens, is to appear in the space provided on the job analysis schedule:

Part 1—State identification number (see app. IV).

Part 2—Number of employees in establishment in which analyses are made.

Part 3—Numbers assigned to identify a specific establishment.

> Example: Analysts of State agency "A," having State identification number 99, conducted their first job analysis study in a plant having 3,500 employees. The establishment number 99-3500-1 was assigned to identify the study. The 43d plant in which job analysis studies were made had 409 employees and was assigned the establishment number 99-409-43.

Parts 2 and 3 serve as a means for identifying a specific establishment. The establishment number is included also on the narrative report, staffing schedules, and plant control card. The name of the establishment in which analyses are made should not appear on the job analysis schedule.

Item 5

Date

The date on which the analysis was made should be entered here.

Number of Sheets

The total number of sheets in the schedule should be noted. At the top of each supplementary sheet should be placed the number of the sheet together with the total number of sheets in the form of a fraction as: 1/8, 2/8, 3/8 . . .

Item 6

Alternate Titles

Enter here any titles, other than the one entered in item 1, by which the job may be known. These titles should be terms which are widely used and recognized in the plant. The inclusion of titles in this space is taken to mean that the titles are synonymous with the main title and that the entire analysis as written applies to all the titles listed. For example, Material Keeper, Storekeeper, and Supply Room Clerk were found to be alternate titles for Stock Clerk. On the other hand, Pipe Calker and Pipe Layer are not alternates for Plumber because they refer to only a portion of the work of a Plumber.

Item 7

Dictionary Title and Code

If the job being analyzed can be identified in volume I of the *Dictionary of Occupational Titles*, the Dictionary title and code should be entered here. It must be remembered, however, that a complete entry can be made here only when the job under analysis is identical in all significant respects to a job defined in the Dictionary.

This procedure has its primary application when Dictionary definitions are verified directly to supply supplementary information for local office use, or for purposes of revising existing Dictionary definitions. The analyst should not attempt to assign the full title and code when analyzing jobs that are not already covered in the Dictionary.

If the job is one which has not been defined previously and coded in the Dictionary, the analyst should select the occupational group in which he believes the job should be coded, and should record on the schedule the first three digits of the code. This assignment serves as a recommendation by the analyst to guide the definition writer in assigning the complete code.

The assignment of the first three digits must be carefully considered after the analyst reviews all phases of the job and compares the job with the Dictionary criteria established for classifying jobs according to the major code groups. If the analyst has gained additional information which will assist in classifying the jobs, he should be sure to enter such information appropriately under "Comments."

Items 8, 9, 10

Industry, Branch, Department

These three items are so closely associated that they can best be discussed and illustrated together.

Item 8—Industry. Enter here the title of the industry in which the job is found. This title usually will have been designated to the analyst or the crew supervisor prior to the beginning of the study; otherwise the common name of the industry should be used.

Item 9—Branch. Some industries are subdivided into branches, each of which represents a broad phase of activity in the industry. The analyst must be very careful to distinguish between the branch of an industry and a department of an establishment. Generally, the distinction between the two is one of degree only, for normally a given establishment in its entirety may be allocated to a branch of an industry.

Item 10—Department. Under this item the analyst should enter the name of the department in which the job being analyzed is found. This name should be the one used by the establishment.

Examples of entries which might appear under these items are: Ammunition Manufacturing Industry, Shell Loading Branch, Maintenance Department; Bakery Products Industry, Bread Branch, Mixing Department; Electrical Equipment Manufacturing Industry, Incandescent Lamp Branch, Assembly Department.

Occasionally it may be desirable to divide a department into sections or subdepartments in order to give a clearer picture of plant organization. A situation in the Electrical Equipment Manufacturing Industry is representative of this. In the Winding Department there are the A.C. (alternating current), D.C. (direct current), and Commutator Assembly sections. In this case entries in items 8, 9, and 10 might be: Electrical Equipment Manufacturing Industry, Motors and Generators Branch, Winding Department, A.C. Section.

PART 2

WORK PERFORMED

This section of the analysis is intended to present a clear, concise, factually accurate statement regarding the tasks performed by a worker in accomplishing the purpose of his job.

The extent of a job is determined by the total of all the tasks which must be performed on the job and by their specific nature. In the job analysis schedule, the extent of a job is established by the Work Performed and by associated descriptions of Equipment, Materials, and Supplies noted in the Work Performed. To define clearly the scope of the job, the Work Performed must describe what the worker does, how he does it, and why he does it. In other words, this portion of the schedule must satisfy the first three parts of the Job Analysis Formula. The manner in which this information should be presented will be explained and discussed in detail.

Item 11

Work Performed

The Work Performed item must present, in concise form, a thorough and complete description of the duties of the job. It should give a correct portrayal of the identity, purpose, content, and requirements of each job, but it is not meant to be a detailed time and motion study. It should consist of an introductory sentence that gives an overall identification to the job in as few words as possible, followed by an orderly series of statements that describe each step of the job.

The introductory sentence of the Work Performed must immediately orient the reader with respect to the scope of the job. Its function is to give the reader an overall concept of the purpose, nature, and extent of the tasks performed, and to show how the job differs generally from other jobs. In composing this, the selection of words is most important. The terms used must be sufficiently precise to highlight the important aspects of the job and to distinguish the job from others. If the analyst cannot avoid the use of general terms, he must qualify and explain them in subsequent material. When writing this introduction, the analyst should ask himself:

1. What is the outstanding factor in this job which differentiates it from all other jobs?
2. What words can I use in writing this sentence that will convey the most precise meaning to the person who will utilize the schedule?
3. What details should I add to the sentence that will throw further light on the total picture?

Typical first sentences which carry out this idea might be:

ENGINE LATHE OPERATOR, FIRST CLASS: Sets up and operates an Engine Lathe to turn small airplane fittings from brass or steel bar stock or from unfinished aluminum or magnesium alloy castings, finishing the fittings down to specified close tolerances.

WOOD TOOL MAKER: Assigns work to and supervises a group of 20 to 30 workers engaged in constructing wood and wood-and-steel-plate form blocks, router boards, and fixtures used in the shaping, assembly, and inspection of airplane parts.

The remainder of the Work Performed should expand upon the introductory sentence and explain the important details of the job so logically, concisely, and specifically that a totally uninformed reader can visualize the tasks and understand the job with a minimum of reorganization of the data.

The material following the introduction must, therefore, consist of an orderly presentation of the tasks of the job. This presentation is best composed of a series of statements telling succinctly what the worker does, and why and how he performs the various tasks. Each of these statements can be considered as a task of the job. It is here that the organizational ability of the analyst is called into full play, for he must organize his material so that the clearest job picture is presented.

Generally, in describing the tasks that comprise a job the analyst should arrange them in either a chronological or a functional order. Tasks can be arranged chronologically when a job has a specific cycle or sequence of operations. The analyst should describe the tasks the worker is called upon to do in the order in which he performs them. Applied to some machine-type jobs, the tasks could be arranged in the following order:

1. Sets Up Machine.
2. Mounts Work Piece
3. Operates Machine.
4. Removes Work Piece.
5. Inspects Work Piece.
6. Maintains Tools.
7. Maintains Machine.

Job tasks and duties can be arranged chronologically with factory-production type jobs, jobs that are relatively simple, or jobs for which the skill involved is limited.

A functional arrangement of job tasks and duties should be used by the analyst for jobs having no regular cycle of operations. This type of job is usually more difficult to analyze, since it involves a considerable variety of job duties and responsibilities that generally have no established sequence of operations.

For example, the tasks of an office clerical job may be arranged as follows:

1. Types narrative and statistical reports.
2. Tabulates and posts data in various record books.
3. Files reports and correspondence.
4. Receives callers, and gives them information.
5. Estimates need for requisitions, and distributes supplies.

The tasks of a chemist may be organized as follows:

1. Testing and Analysis.
   Tests and analyzes raw materials or manufactured products for conformance to plant standards.
2. Research and Development.
   Conducts controlled experiments to devise new methods for improving production, for testing and analyzing raw materials and products, for adapting substances to new uses, and for recovering and utilizing byproducts.
3. Production Supervision.
   Supervises manufacturing processes and operations, including the measuring and mixing of ingredients, and the control of chemical reactions during processes.

The functional arrangement is used for the most part for clerical, technical, managerial, and professional jobs.

Normally, each of the items listed in the previous discussion as typical major steps in the operation of some machines would constitute one numbered task and all of the details explaining it would be stated directly under it. This outline of typical tasks, of course, cannot be used for all jobs. If, for example, the whole job consists of setting up machines, the setup should not be treated as a single task but should be broken down into its major elements or steps, or if the whole job consists of analyzing costs, this process should be accorded similar treatment. The primary consideration is to organize the statement so that the uninformed reader can obtain a clear concept of the work performed on the job.

Especially important in giving a clear concept of the work performed on a job is the style in which the analyst prepares his presentation. The presentation should be a concise, well worded, easily read, informative narrative constructed on the outline of the organization decided upon. It must not be the outline itself. In a narrative the analyst constructs the job as he analyzed it. In an outline he forces his reader to construct the job, a situation that is highly susceptible to error. Conciseness refers to the exactness of well-chosen words having specific meanings and not to brevity such as the "telegraphic" style of writing represents.

The information given must be specific and must contain sufficient detail to satisfy the requirements of the first three parts of the Job Analysis Formula—that is, "What," "How," and "Why." It must not, however, confuse the reader with a mass of relatively unimportant facts. It is necessary and important to observe and evaluate accurately all of the details of the job, and then to segregate and record only those that are pertinent to the "What," "How," and "Why."

The fourth part of the Job Analysis Formula, the "Skill Involved," must also be carefully considered in presenting each job task. The "Skill Involved" consists of such factors as Responsibility, Dexterity and Accuracy, and Job Knowledge, all of which will be considered in the Performance Requirements section. Whenever possible, the Work Performed must be so worded that the "Skill Involved" in the tasks can be directly related to the Performance Requirements.

In composing the body of the Work Performed so as to obtain the clearest presentation, the analyst should divide the job into its major tasks and allocate one numbered statement to each. Each task should be introduced with a flag statement, which shows generally what is being done, followed by a detailed account of how and why it is done. In the following task taken from the job of ENGINE LATHE OPERATOR, FIRST CLASS, the flag is "Sets Up Lathe."

"Sets Up Lathe: Examines blueprints to determine the dimensions of the part to be machined, using shop mathematics to calculate any dimensions not given directly on the prints or to calculate machine settings. Attaches to lathe such accessories as chuck and tool holder; threads and locks the chuck on the headstock spindle; and sets and tightens the tool holder in the tool carriage with a setscrew and wrench. Opens the chuck jaws to the approximate size of the workpiece with a chuckwrench, inserts the workpiece between the jaws, and tightens the jaws down on it. Centers the workpiece in the chuck jaws, locating a dial indicator against the workpiece, rotating the chuck and workpiece by hand, and making coincident minor adjustments to the chuck jaws until all 'wobble' in the workpiece disappears as shown by the needle of the indicator. Selects a cutting tool shaped and sharpened for the type of metal and type of cut to be made and clamps it at a suitable cutting angle in the holding dog of the toolholder, judging the angle of cut by eye. Referring to a handbook or on the basis of experience, selects the correct lathe speed according to the metal of the workpiece and the type of cut to be made. Sets the lathe speed control levers to the selected speed."

The style to be followed in preparing the Work Performed should conform to four basic rules governing most types of occupational analysis writing:

1. A terse, direct style should be used.
2. Each sentence should begin with an action verb.

3. The present tense should be used throughout.

4. All words should impart necessary information; others should be omitted.

The analyst can readily understand the application of these four basic rules of writing style by a study of the preceding example and an examination of the sample schedules in the appendix of this manual. The use of long and involved sentences should be avoided, since these are likely to be both confusing and misleading to the reader.

When the analyst composes any sentence or any phrase describing any portion of the Work Performed, he should immediately measure the quality of what he has written by consciously applying the Job Analysis Formula to it. He should ask himself, "Does this statement tell what the worker does?" "Does this statement tell how the worker does it?" "Does this statement tell why the worker does it?" If what the analyst has written answers each of these questions, he can be assured of the quality of information he has given. If however, anyone of these questions is left unanswered, the analyst must revise his statement so as to supply the deficiency that the formula has brought to light.

As stated previously, the fourth part of the formula must not be neglected in the analyst's evaluation of what he has written. His statements should tell what is involved in the worker's performance of his tasks so that there will be an adequate tie-in between the Work Performed and the Performance Requirements.

Every precaution should be taken to use words that have only one possible connotation and that specifically describe the manner in which the work is accomplished. For example, expressions such as "transports material" should be avoided. The worker carries the materials in his arms or in a basket, or pushes a loaded dolly, or drives an electric truck, or accomplishes the "transportation" in some other specific manner.

To cite another example, it is inadequate to record merely that the worker "feeds the machine." Does he insert the pieces one at a time in an indexing head, does he hold the workpiece, or does he clamp it in a jig?

The analyst should keep in mind the necessity for stating a task completely but should not allow the explanation to develop into a motion study. For example, regarding an inspector of small parts, it may be said, "slides fingertips over machined edges to detect ragged edges and burs." On the other hand, it would be absurd to state, "raises right hand 1 foot to table height, superimposes hand over mechanical part and, by depressing the first and second fingers to the machined part and moving the arm slowly sidewise about 6 inches, feels with his fingertips for snags or pricks that are indicative of surface irregularities."

The Work Performed should include duties that are performed infrequently as well as in the normal work cycle. Such tasks as the occasional setup of a machine, occasional repairs, infrequent reports, and the like should be described with a notation concerning their frequency of performance. However, if any of these duties consume enough of the worker's time to enable the analyst to make a definite notation as to the percent of time, it will not be necessary to indicate their frequency in the narrative. In arranging the presentation of tasks, these occasional tasks will follow the major tasks.

In recording the tasks under Work Performed, the analyst must be particularly careful to mention all tools and equipment which the worker uses. Any special or unusual machines or equipment should begin with an initial capital letter the first time they appear in the Work Performed and those which are defined under Item 20 (Equipment, Materials, and Supplies) should be underlined the first time they appear. Similarly, all technical or little-known terms or terms with unusual meanings, which are defined in the "Comments" section, should be underlined the first time that they appear in the Work Performed section. This is necessary so that the reader will know immediately that the definitions are in the schedule and that he can turn to them for information.

The tasks of the job are thus presented as consecutively numbered and paragraphed statements. At the end of each must be included a parenthetical notation giving the approximate percent of time and degree of skill involved in the performance of the tasks described.

Both the percent of time and the degree of skill provide valuable clues concerning the emphasis to be placed on the various job tasks by the processors of the job data. Obviously the most skilled items are the ones that will interest the interviewer the most when talking to an applicant, since these items are usually major employment factors. The percent of time aids in understanding jobs which involve a variety of duties.

The percent of time should be on the basis of 100 percent for all of the tasks performed. Since it is impracticable for the analyst to make an extremely fine determination of the percent of time taken up by each of the tasks in a job, he should not consider any figure less than 5 percent. Estimates made by consulting either the worker whose job is being observed or the worker's supervisor will be sufficiently accurate.

The degree of skill of each task should be indicated by the figures 1, 2, and 3: "1" being used to express the lowest degree of skill, and "3" the highest degree. When assigning the ratings to tasks in a job, only the job being analyzed is considered. This must be adhered to strictly because it is not possible to compare the tasks involved in different jobs. What might be a "3" skill for a task of one job might only deserve a rating of "1" in another job, depending on the complexity or simplicity of the jobs.

Following this line of reasoning, every job will contain a "3" task, since every job has its own "most difficult task." As a convention, therefore, a job so simple as to contain only one task will have it designated 3-1, since this one task covers the entire span of difficulty contained on the one job.

In assigning the degree of skill and the percent of time for a task, the degree of skill should be noted first and the percentage of time noted second. The two should be separated by a hyphen and enclosed in parentheses. Thus, a skill level of 3 for a task consuming 60 percent of the worker's time would be noted (3-60%).

PART 3

SOURCES OF WORKERS

This section of the job analysis schedule is designed to indicate where workers can be recruited for the job analyzed and point out the experience and training that a worker who is seeking the job must have. This information is required for the placement officer who must replace an experienced worker with another worker who has the necessary qualifications, for the vocational counselor seeking to place inexperienced applicants, and for the same counselor who must assist workers in transferring from a field in which they are experienced to another type of work. In addition, upgrading and similar job engineering problems are reflected here.

In general, there are two broad sources of worker skill which provide clues to worker sources: job experience and training not necessarily associated with experience. This section of the schedule is divided on that basis.

Item 12

Experience

Here should be listed any experience that a worker must have had before he can satisfactorily perform the job.

If no occupational experience is necessary, an "X" should be placed after the word "None." This indicates that the job is open to the inexperienced applicants and is what is known as an "Entry Job." However, an inexperienced applicant may be required to possess specific training to compensate in whole or in part for his lack of work experience.

If the job is not an entry job, after the heading "Acceptable" the analyst should list the titles of the job or jobs which do provide the experience necessary for successful job performance. These should be identified by titles from the *Dictionary of Occupational Titles* whenever possible. If any related job is known also by a title other than a Dictionary title, that title should be noted.

The analyst, on the basis of occupational knowledge or placement experience, may be familiar with occupations which he feels are related to the job analyzed. Such occupations should be discussed with the employer to determine their applicability. If such suggestions seem practicable to the employer, the job titles should be listed and an appropriate explanation should be made in the "Comments" section as to why the jobs seem a feasible source of workers.

For example, a job analysis of SHIP RIGGER might well have listed in this item the following job title: ABLE SEAMAN (see "Comments").

The relationship may then be stated in the "Comments" section as follows:

"ABLE SEAMAN.—Experienced workers in this job usually are capable of performing nearly all the tasks of SHIP RIGGER. They generally are capable of splicing rope and wire cable and are familiar with ship rigging tools, and their experience usually includes splicing fittings into wire cables, finishing splices, and familiarity with rigging crane-hoist equipment. In the absence of fully qualified workers, this occupation is probably the next best source of workers."

This part of the schedule requires considerable skill on the part of the analyst in interviewing members of the personnel department, the worker's foreman, and experienced workers. Care must be exercised in evaluating the information secured.

The basic approach to be taken by the analyst in interviewing qualified plant personnel to secure such information should be: "When no fully experienced workers are available, from what other jobs do you hire workers for this job? In what other plants or industries can workers get training or experience that would be of value on this job? What jobs?"

Item 13

Training Data

The intent of this item is to present complete information regarding the training that is either required or helpful in preparing workers for the job under study. Specifically, it is intended to bring out the exact nature of the training that is either required or desirable, and the physical or mental skills which that training develops and how those skills apply directly to the job.

The data for this item are obtainable through interviews with experienced workers, the worker's foremen, and members of the personnel department. Information obtained from a worker must be verified by the foreman or the personnel department to insure that the data apply to all workers and are not merely the qualifications of that particular worker.

The subitem "Minimum Training Time" indicates the time required to train workers for the job. If the job requires no experience as checked in item 12, the analyst must enter after item 13a, "Inexperienced Workers," the average on-the-job training time required before an inexperienced worker can perform the job satisfactorily. If experience is required, the analyst must enter after item 13b, "Experienced Workers," the average on-the-job training time necessary before a worker who has the experience indicated as "acceptable" can perform the job satisfactorily. The entries made here must be consistent with those made under item 12, "Experience," so the two will be properly related.

The remainder of this item is a table which is used to record the specific type and specific results of training that prepare a worker for successful job performance. The portion of the table headed "Training" is for the purpose of entering the exact nature of the training. The portion headed "Specific Job Skills Acquired Through Training" shows the manner in which the training applies directly to the job.

Under the heading "Training" are listed five general considerations which embrace most types of training. These considerations are: In-Plant Training, Vocational Training, Technical Training, General Education, and Activities and Hobbies.

In-Plant Training.—This refers to any training given or sponsored by an employer either on or off his own premises intended as preparation for a specific job in his plant. The title and the exact nature of any training course, if given, are to be entered here.

Vocational Training.—This refers to any training conducted by private or vocational schools intended to develop general or specific skills but not directed to a specified job as it exists in any one plant. Here are to be indicated any training courses which apply to the particular job.

Technical Training.—This refers to any training of a technical nature above the high school level. Examples are Sciences, Medicine, Engineering, and Architecture. Any specific courses which apply are to be entered here.

General Education.—This section refers to any education of the type given in public or private elementary or secondary schools. Such subjects as high school physics, elementary arithmetic, and chemistry which are either required or would prove helpful are to be noted. If only the ability to speak, read, or write English is required, the letters which apply should be circled.

Activities and Hobbies.—Persons who engage in an avocation for recreation occasionally attain high proficiency in the physical and mental skills of the avocation. The pursuit of the activity also indicates a liking or interest in the field represented and, hence, the possibility of successful job accomplishment in that field. For these reasons, vocational counselors pay close attention to relationships between avocations and jobs, and this part of the schedule must be included as a further source of training information.

The portion of the table headed "Specific Job Skills Acquired Through Training" is to show the manner in which the training applies directly to the job. Here, in terms of Job Knowledge and Dexterity and Accuracy (see "Performance Requirements," p. 20), the analyst states specifically what the worker gains from the training and the part of the job to which the training relates.

This information indicates the exact way any particular training contributes toward the total skill required for a job. Conversely, the knowledges or manual skills which are not developed by the training provide a means of measuring the additional on-the-job training the worker must receive to become fully qualified.

In completing this portion of the item, the analyst should review the items Job Knowledge and Dexterity and Accuracy, and should contribute from his own knowledge of educational and vocational courses. He should recognize that management may not be familiar with the content of all courses which provide training for the job analyzed. Therefore, if he knows of any courses or activities that provide training in specific mental or physical skills found in the job, he should note them and comment on them appropriately.

Item 14

Apprenticeship

There are certain jobs which are entered with the intention of acquiring a more or less well-defined combination of experience and training at the conclusion of which the worker is considered a skilled worker in his occupation. This method of training is known as apprenticeship.

If an employee at a work station is performing his tasks in fulfillment of a portion of an apprenticeship, he is an apprentice and the analyst should make no analysis of the work done.

If, however, the employee has completed an apprenticeship, he is a skilled worker in a trade and an analysis should be made with appropriate entries under item 14.

In a formal apprenticeship the apprentice progresses through a prescribed course combining work experience and related instruction in all phases of a craft. This situation is described in part by the following definition:

> APPRENTICE (any ind.). A worker who learns, according to a written or oral contractual agreement, a recognized craft or trade requiring two or more years of on-the-job training through job experience supplemented by related instruction prior to the time that he may be considered a qualified skilled worker. APPRENTICES are seldom over 30 years of age. High school or vocational school education is generally a prerequisite for entry into an apprenticeship program. Provisions of apprenticeship agreement regularly include length of apprenticeship; a progressive scale of wages; work processes to be taught; and amount of instruction in subject related to the craft or trade, such as characteristics of materials used, selected shop mathematics, and blueprint reading. Apprenticeability of a particular craft or trade is best evidenced by its acceptability for registration as a trade by a State apprenticeship agency or the Federal Bureau of Apprenticeship and Training. Generally, where employees are represented by a union, apprenticeship programs come under the guidance of joint apprenticeship committees composed of representatives of the employers or the employer association and representatives of the employees. These committees may determine need for APPRENTICES in a locality and establish minimum apprenticeship standards of education, experience, and training. In instances where committees do not exist, apprenticeship agreement is made between APPRENTICE and employer, or an employer group. The title APPRENTICE is often loosely used as a synonym for beginner, HELPER, or LEARNER. This practice is technically incorrect, and leads to confusion in determining what is meant.

If the criteria indicated in the above definition for APPRENTICE are met fully, the job is entered through a formal apprenticeship. A check should be placed after the word "Formal" and the duration and title of the apprenticeship should be entered.

The term "informal apprenticeship" no longer applies and should be deleted from the job analysis schedule.

Item 15

Relation to Other Jobs

This item is intended to indicate the relationship of the job under study to other jobs in the same plant or establishment. It indicates upgrading and transfer relationships, and, besides indicating further sources of workers, makes possible a more accurate classification of jobs according to their activity. To report complete and accurate information regarding the job under study, it is necessary to show supervisory lines and the nature of the supervision by which jobs of varying levels of importance are related. This information usually is obtained from the personnel department and from the foremen. To unify the presentation of information, the item is divided into three subitems each of which is discussed separately.

Subitem a. Promotions from and to, transfers, etc.—To describe intraplant job relationships, the analyst should answer these general questions about the job:

"From what jobs are workers promoted to this job?" The titles of jobs from which workers logically can be advanced to this job should be supplied here. Extremely unlikely promotions or ridiculously huge steps of promotion should not be indicated.

"To what jobs (not involving promotion or demotion) may workers on this job be transferred?" When two jobs are so comparable that a worker from the first can perform the second competently, and a worker from the second can likewise perform the first, the two jobs are indicated as transferable.

"To what jobs are workers on this job promoted?" The entries to be made here are the titles of the jobs to which the workers logically advance.

If the above considerations are not adequate to cover existing job relationships, the analyst should make a note to that effect and explain the situation under the "Comments" section.

Subitem b. Supervision Received.—The essential requirement of this item is to show the amount of responsibility for the quality and quantity of his production or performance that is left to the worker. The supervision received by the worker should be indicated by marking "X" after the appropriate degree. "General" means that the worker is given overall casual supervision. "Close" means that the worker is given specific detailed instructions from a worker having authority over him, particularly at the beginning of a task, and a constant check is kept on his work or performance. The title of the worker from whom the supervision is received should be entered in the space following the word "Title."

Subitem C. Supervision Given.—If the worker on the job being analyzed has supervision of others as a part of his duties, the number supervised and the titles of their jobs should be known.

Where the titles of the workers supervised are numerous, a statement of the names and work objectives of the groups supervised is sufficient, but from the statement made, supplemented as necessary by a note in the "Comments" section, the titles should be reasonably perceivable. If no workers are supervised, mark "X" after "None."

PART 4

PERFORMANCE REQUIREMENTS

Up to now the manual has dealt primarily with those phases of the job that may be recorded in the desired detail after careful observation and reporting. The primary purpose so far has been to define exactly the natural range of activities or work tasks involved in a job. This information, however, falls short of providing all of the facts that are necessary for understanding the job and for completing a clear picture of its important characteristics.

It is the purpose of this section to show the analyst how to round out the total picture of the job by indicating the level of difficulty of the work tasks. This level of difficulty is not to be confused with the "degree of skill" discussed in the "Work Performed" section. More specifically, the items in this section include the highly important explanatory information necessary to complete the Job Analysis Formula, the "What," "How," and "Why" of which were brought out in the Work Performed. This information expresses the "Skill Involved" in specific terms. It is a detailed analysis and interpretation of the basic minimum skills, knowledges, abilities, and responsibilities required of the worker for successful performance of the job.

For example, a description of the work performed by the worker may produce an accurate picture of the concrete physical portions of the tasks, but it is just as important to know what knowledge, training, and experience are needed to execute those tasks at the right time, in the right order, and in the right manner. Consequently, it is necessary to determine whether the execution of the tasks depends on any skills, knowledges, exercise of judgment, or other intangible factors, and to make specific statements emphasizing those factors. This applies to the job as a whole as well as to each separate task.

This section of the schedule consists of a listing and an explanation of all basic elements which must be considered in analyzing any job. It has been established by thorough and careful investigation that the factors included in this section are adequate and sufficiently comprehensive to bring out properly the skills, knowledges, abilities, and other characteristics required of a worker by any job, regardless of whether the job is manual, craft, professional, clerical, or other type. It might be considered as a guide list to aid the analyst in obtaining and recording all the information necessary to discriminate between jobs and to establish definitely the degree of difficulty of any job.

The analyst can be assured that, if this guide list is properly utilized, all of the essential information necessary to supplement the Work Performed will be included in the schedule and that the schedule will be adequate to classify the job on the basis of level of skill and to assure discrimination between the job analyzed and other closely related jobs. This information is very important to all concerned with the job analysis because it represents the skill components which, must be considered in the preparation of most occupational analysis products.

The Performance Requirements are covered by four specific factors:

Responsibility
Job Knowledge
Mental Application
Dexterity and Accuracy

The definitions of these factors are to be found on pages 22, 24, 25, and 26, respectively, under numerical headings corresponding to the numbered items of the job analysis schedule form. They should be carefully studied in connection with the following discussion.

It is at this point that the information the analyst has obtained about a job (as reported in the Work Performed) must be supplemented by a detailed analysis of the report itself. This requires of the analyst a concentrated analysis in the sense of weighing, considering, and evaluating that which he has learned. In preparing a Work Performed, the primary purpose of the analyst is to convey a clear and understandable picture of the job as it exists. In preparing the Performance Requirements, he must break down the job into component factors, measure these factors and, by doing so, explain the fundamental nature of the job in terms of its successful performance.

As stated previously, the Performance Requirements primarily serve to establish the level of difficulty of the tasks described in the Work Performed, and, in so doing, aid in identifying the job tasks and in clarifying the "What," "How," and "Why" described in the Work Performed.

In attaining this objective, the analyst should review carefully each task of the Work Performed in the light of the Performance Requirements, noting the presence and degree of each requirement or factor that is involved in the task. If this is done properly, the description of factors present in the total job will be complete and will cover the skills, knowledges, and abilities required of the worker. Treatment of this kind will avoid highly involved writing which would be necessary if the attempt were made to state the skills required for each task within the Work Performed itself.

For this reason, the analyst usually will find it desirable to complete this section immediately following the preparation of the Work Performed. Each task then can be reviewed separately and the presence and degree to which each factor is involved in the task can be determined. This information then should be consolidated so that the written statement for each factor covers the degree to which that factor is involved in the total job.

It must be emphasized that the mere statement that a given factor exists or does not exist is not enough. The degree to which it exists should be stated specifically. For example, the fact that a worker is responsible for the safety of others means little by itself. The responsibility of the worker for what injuries to what worker and the extent of the resulting injuries must be explained. In this connection, it is important to note also the degree to which the worker is responsible or is not responsible for the initial occurrence of the accident.

While the Work Performed and the Performance Requirements must be related to and must support each other, these two sections are fundamentally not the same. Rather, the Performance Requirements may be considered as devices which evaluate the Work Performed, measure its degree of difficulty, and determine the exact nature of the work tasks.

The Performance Requirements will contain some information already given in the Work Performed because the two are related closely in terms of the tasks performed. In addition, the Performance Requirements constitute a synthesis of all information, either stated or implied, concerning each factor throughout the scope of the job.

In many cases, it will not be possible to differentiate sharply between informational statements which must be given in several Performance Requirements. Such information may overlap or contain conditions which form a part of two closely related factors, such as Job Knowledge and Mental Application. However, the analyst should experience little difficulty, provided he describes each factor in terms of the definition of that factor. In many cases, the analyst will find that the same information, in different terms, must appear in two or more factors in order to give a clear concept of what is involved in the job. This is not to be considered as duplication but as different viewpoints of the same circumstance.

All factors which are stated as existing in a job should be reflected in and related to the Work Performed. It should be possible for the schedule reviewer to refer to the Work Performed and find the exact phases of the work which are conditioned by a specific factor.

Conversely, the reviewer should find it possible to locate in the Performance Requirements all the skills and abilities necessary to perform any task which is mentioned in the Work Performed.

Entries under this section will not follow a rigid writing style, but, whenever possible, the statements should be written in the form of requirements. That is, the subject (the worker) is understood and each statement will begin with such words as "must be," "must exercise," "is responsible for," or similarly appropriate wording.

When composing the entries, the analyst should avoid the use of generalized words such as "normal," "great," "careful," and the like which mean little except in a relative sense. In most cases, specific examples can be given, comparisons drawn, or limits described which will define accurately the degree to which a factor exists, and by so doing, will eliminate the necessity for overall limiting words. The analyst often will find it desirable to draw on his knowledge of jobs other than the one under consideration to provide him with the means of comparison.

In completing this section, the analyst should bear in mind that, since the Performance Requirements constitute fundamental information, there should be no omissions. The nonexistence of any given factor in a single job, or its existence to a low degree, provides just as pertinent information about that job as does the existence of any other factor no matter how high the degree. It is, therefore, just as deserving of comment in the schedule as any other factor concerned with the job. In comparing jobs on the basis of job schedules, this "negative information" often provides specific clues to the nature of the jobs involved.

In order to make clear the type of information desired under each factor, each of the factors is discussed separately.

Item 16

Responsibility

This factor relates to the degree of supervision received and exercised, the number of checks set up to prevent or catch errors, the decision limits within which a job must conform, and the degree of loss that would result from error, or the saving that would be effected by foresight.

The major considerations affecting this factor are:

1. Does worker delegate work to others? How? To whom?
2: Does worker coordinate the efforts of subordinates? How?
3. Is worker accountable for progress, quality, and costs of work?
4. Does worker train others? Whom?
5. What are the nature and the magnitude of supervisory control?

6. Does work require contacts with outsiders or others in the organization not in line of authority? Of what nature and with whom?

7. What are the nature and the scope of commitments made?

8. To what extent is work verified by others?

Jobs must be examined for the relative amount of each of these considerations as well as their presence.

The kinds of responsibility that exist in a job are usually relatively simple for the analyst to determine and to interpret in quantitative terms; that is, in terms of the money value of equipment or materials that the worker could ruin, the number of people supervised, or the extent and degree of injuries the worker could cause to himself or other workers through carelessness.

However, the analyst must not stop at that point. He must consider the limitations placed on the responsibility of the worker. These are such points as the kind of supervision exercised, the number of checks set up to prevent or catch errors, safety devices on machines and equipment to prevent injury to the worker or to other workers, and the limits placed on decisions the worker makes. For example, a worker who performs his tasks under very close supervision has much less responsibility for quality and quantity of production than another worker who performs the same tasks under little or no supervision.

The analyst should remember that all of these points must be carefully considered when completing this item of the Performance Requirements if a true picture of the total responsibility involved in a job is to be presented.

Typical statements required under this item are:

"DIAMOND TOOL MAKER: Responsible for making diamond cutting tools which have average value of about $65 up to $130 each and which require 15 to 30 days [of grinding] to complete. Delay in completing tools could result in shutting down production line expecting them."

"AUTOMATIC SCREW MACHINE SETUP MAN: Responsible for setting up and supervising setting up of all automatic screw machines. Responsible for instructing operators in maintenance of machines, sharpening of tools, and gaging of parts. Responsible for preventing damage to machines worth $7,000 to $10,000 each, although complete destruction to machine is unlikely. Could ruin a setup resulting in loss of several hours' setup time, cutting tools worth about $4 each in blank stage, spindles at $150 each, and $300 diamond grinding wheel. Failure to achieve setup could mean loss of production and in some cases could hold up assembly lines. Responsible for assisting in development work by giving technical advice and assistance to Engineering Department and by setting up for sample runs, for which he must devise and make cams for machine setup."

"SAFETY ENGINEER: Responsible for the safety of the Jersey City plant and its employees, and for the development of a safety program. Responsible for making decisions as to whether a condition is hazardous or not, and prescribing a remedy. Responsible for seeing that safety rules are obeyed by plant personnel, and for maintaining safety equipment up to date and in good working order. Responsible for keeping management informed on current modern safety equipment and measures."

"TOOL PLANNING ENGINEER: Is responsible for carrying out instructions of General Manager. Is responsible for items involved in cost of product, such as purchased tools and utilization of labor and equipment by tooling sequences and production methods. Is responsible for practicability of designs to avoid waste of materials. Is responsible for accurate instructions and for accuracy of working drawings, blueprints, process sheets, and other work completed by subordinates. Is responsible for obtaining cooperation of related departments, such as purchasing and production. Is responsible for quality and performance of product."

"JOB ANALYST: Is responsible for providing information for major portion of personnel reclassifications and for development of factual data and analysis regarding new jobs for management committees. Initiative and judgment are necessary to classify positions correctly and to maintain and improve job analysis techniques. Errors could result in needless salary expense or could affect employee morale to a moderate degree before coming to the attention of personnel officials."

Item 17

Job Knowledge

This factor refers to the practical knowledge of equipment, materials, working procedures, techniques, and processes required of the worker for the successful handling of a job. The practical knowledge requirement includes that which must be acquired after appointment to perform efficiently the work tasks, as well as that which must be acquired as a prerequisite to appointment.

Job knowledge includes all of the knowledge required of the worker by the job, whether that knowledge is gained by actual on-the-job experience, by academic courses of training prior to entry on the job, or by both. When thinking of this factor, consideration should be given to a variety of specifications, materials, and assignments encountered, and guidelines governing decisions and operations, such as precedent, regulations, standards, and practices. Consideration should also be given to such points of pre-employment or on-the-job knowledge as:

1. Knowledge of machines and equipment used.
2. Knowledge of materials used.
3. Knowledge of working procedures and techniques.
4. Knowledge of product flow or process as related to the job.
5. Knowledge of dimensional or formulary calculations.

When writing the Job Knowledge requirements, the analyst must mentally review all the tasks observed in the job and determine just what specific knowledges the worker must have for satisfactory performance and the extent or degree of each required knowledge. The degree usually can be brought out only by a very careful choice of words and by specific statements. The statement "Must have a thorough knowledge of heat-treating metals" does not give an exact explanation of the extent of the knowledge required since the statement is too general. However, if it were stated, "Must know the heat-treating temperatures and types of quenches to be used when hardening, annealing, or normalizing steel parts," the specific knowledges required would be brought out and their degree indicated adequately.

Examples of the types of statements required under Job Knowledge are:

"HAIRSPRING TRUER: Must know where to apply tweezers and with what amount of force to bend hairsprings to bring them into round and flat. Must be able to make visual measurements in checking concentricity of hairspring coils."

"MODEL MAKER: Must be able to read and interpret blueprints, rough drawings, and written instructions and to understand verbal instructions. Must be able to set up and operate any machine in machine shop. Must have knowledge of shop mathematics through trigonometry. Must have thorough knowledge of working properties of materials, such as steel, brass, plastics, gold, silver, platinum, zinc, and various aluminum and steel alloys."

"COLOR MATCHER: Must have knowledge of physical and chemical properties of plastics and some 200 dyestuffs used in coloring plastics. Must be able to distinguish between fine shades of coloring. Must have a knowledge of simple algebra and arithmetic such as are used in developing color formulas. Must know thoroughly the procedure and techniques of coloring and mixing plastics materials."

"UPLAND GAME BIOLOGIST: Must know plumage characteristics of pheasants to determine age and growth. Must have knowledge of life histories and habits of most game and many nongame species of birds and animals. Must know game and fish laws and principles of game management."

"RESEARCH DIETITIAN: Must possess a thorough knowledge of the theory and practice of dietetics, including physiology and digestion processes of the human body. Must know bacteriological principles as applied to food spoilage, preparation, and sanitation. Must be able to apply special techniques in planning and preparation of individual meals, varying nutrients content to provide a prescribed diet."

Item 18

Mental Application

"Mental Application" refers to the exercise and maintenance of mental processes required to perform properly the duties of a job. It may be stated as the degree and continuity of thought, mental planning, or mental alterness that must be exercised in performing an operation. It includes mental concentration required because of diversity of work or variety of problems.

Considerations affecting this factor are:

1. Initiative, which refers to the need to face and solve new problems. This involves mental resourcefulness, analytical ability, the making of decisions, and the taking of independent action and should be considered according to the probable frequency of occasions on which the job will require it outside the control or routine of supervision.

2. Adaptability, which refers to the versatility required of the worker or the need, or lack of need, for the worker to handle adequately quick changes in assignment or to carry on several tasks simultaneously.

3. Judgment, which refers to the amount of independent decisionmaking that must be exercised by the worker in performance of a job. The importance of the results obtained by such independent decisionmaking or the extent of the consequences of poor judgment must be considered.

4. Mental alertness, which relates to the attention necessary to tend and feed a machine properly, attention which must be given to orders, and alertness necessary to prevent damage to equipment and materials or injury to personnel.

When describing the degree to which this factor is present in a job, the analyst must ask himself such questions as: "Is the job repetitive or nonrepetitive?" "What degree of supervision does the worker receive?" "What must the worker decide for himself and what are the consequences of poor judgment on his part?" "Must the worker improvise expedients in the course of his work and why is this necessary?" All of these points and many others are usually indicative of the Mental Application required of a worker by a job.

The analyst must not stop after determining the presence of those points which contribute to the total Mental Application in a job but most clearly indicate the degree to which they occur. This usually is done best by indicating the conditions which limit the Mental Application. If, for example, very little initiative is required due to close supervision, an appropriate statement should be made. Or, if a worker must possess considerable adaptability to handle quick changes in assignment, typical assignments should be mentioned to indicate specifically the degree of adaptability required.

The analyst must follow this procedure carefully in order to build up a true picture of the Mental Application required in any job. The following statements illustrate the principles outlined:

"DIE MAKER: Decides method by which some tasks are to be accomplished, such as size and type of machine for machining operations. Must be constantly alert to avoid work failure. Fine punches and dies could be damaged easily, making it necessary to start over again. Must be alert to possible errors in blueprints. Some repetition of tasks occurs in that there is similarity of work in most dies and he is often required to make several dies exactly alike. Decides which operations can be more economically done by other workers."

"HAIRSPRING TRUER: Repetitive, somewhat routine tasks do not require planning or critical decisions. Only decisions necessary are whether to abandon further attempts to true a hairspring and to discard it or to continue. This rarely happens more frequently than twice in 100 hairsprings."

"BIG GAME BIOLOGIST: Must be alert to changing conditions of big game feed and habitat and to evaluate these conditions for specie preservation."

Item 19

Dexterity and Accuracy

This factor refers to the manual or manipulative ability required to perform given work to a required degree of accuracy or precision and to the complexity or intricacy of manual processes involved. The elements to be considered here are characteristics such as the dexterity, accuracy, coordination, expertness, care, and deftness required in manipulating, operating, or processing the materials, tools, instruments, machines, or gages used. The number of units of work normally produced in a given period of time is also a measure of dexterity.

The major considerations affecting this factor are:

1. Dexterity, which relates to the quickness or deftness required, or the coordination of sight or other senses with the muscles.

2. Accuracy, which relates to the degree of precision required in the handling of product or materials and for the adjustment and manipulation of equipment and tools to the required degree of precision.

The analyst must be very careful to use only specific terms which will express the degree of the Dexterity and Accuracy required by the job. Statements such as "Dexterity is normal" or "Accuracy is close" should not be used because "normal," "close," and other general terms convey very little meaning or diverse meanings to the reader. Rather, this requirement should be written in terms of specific tasks in order to bring out more adequately the required degree.

Although Dexterity, as such, cannot be expressed specifically in terms of the amount or degree required, it is closely related to Accuracy which in many cases has specific measures. Often, the precision of work can be stated in terms of allowed tolerances, that is, plus or minus so much from an absolute standard. This range indicates how much the work can depart from the ideal without impairment of job performance.

However, the relative ease or difficulty of maintaining a required standard of accuracy must be taken into consideration because a statement of allowed tolerance or required accuracy in itself will not give a true measure. To illustrate this, consider that one-hundredth-of-an-inch tolerance on an engine lathe is easier to achieve than one thirty-second of an inch in the use of carpenters' handtools because of the nature of the equipment and material used. On the other hand, one-thousandth of an inch is 10 times as fine as one-hundredth, while one sixty-fourth of an inch is only twice as fine as one thirty-second. Yet the care and deftness required to increase the precision in the latter case may be just as difficult as that in the former. Therefore, the analyst should be sure that any requirement of accuracy relates to work performed and to the tools and equipment by which the accuracy is achieved.

The following are statements of requisite Dexterity and Accuracy taken from schedules:

"HAIRSPRING TRUER: Extreme care and dexterity are necessary to manipulate sharp tweezers among coils of very fine hairsprings, measuring as small as 0.00078″ in thickness and with as little as 0.00312″ space between coils. Must have "feel" for tweezers. Works to very fine tolerances which are measured visually only through a loupe. Spacings between coils are compared visually one against another. Coils are adjudged to be in same plane and parallel to balance wheel by visual examination only. Works with very fine material which may easily be damaged beyond salvage. Movements must be quick and certain in order to produce quota."

"MODEL MAKER: Must work to tolerances plus-or-minus 0.0001″ and on parts as small as 0.08″ diameter with pivots as small as 0.0003″ diameter. Average size of part made is under five-sixteenths of an inch."

"AUTOMATIC SCREW MACHINE SETUP MAN: Must be able to set up machine to machine very small parts, frequently less than one-tenth of an inch in length and to obtain tolerances as close as 0.0001″. Must be able to grind and sharpen cutting tools attaining exact specifications as to size and angles. Resharpens fine drills as small as 0.0012″ in diameter."

"COLOR MATCHER: Must be able to discriminate accurately between colors and shades, to determine the hues and values of colors to be developed, and to match production samples accurately with standards. Must measure dyestuffs and record formulas according to specifications. Does not gage thicknesses of samples to close tolerances."

The analyst must remember that this section refers only to manual or manipulative ability and to required physical accuracy or precision. Mental considerations involving accuracy are not to be included here. A common mistake made by the analyst is to include considerations affecting what may be called "mental accuracy," such as maintenance of accurate records or the accurate planning of a sequence of work tasks. Considerations such as those belong properly under the factor Mental Application.

PART 5

COMMENTS

The "Comments" section of the schedule provides the analyst with a medium whereby he can present to the user of the schedule all the background information of a job which the user is not able to obtain firsthand. If the analyst neglects this section, his schedule would be similar to a picture in which the artist had clearly painted his subject but had neglected to paint in a background for the subject.

The importance of this section cannot be overemphasized. Only too often an analyst has brought much confusion and doubt to schedule users by neglecting to enter here the type of information which throws the job into its true perspective. Here the analyst can enter information which cannot readily be entered in other parts of the schedule. In addition, the analyst is urged to include collateral or supplementary information needed to give schedule users the best understanding of the job and its relation to the process or service in which it was observed.

Item 20

Equipment, Materials, and Supplies

Equipment, materials, and supplies which the worker uses, handles, or with which he works will be included in this item in that order. If any of these are not common or have a unique application as used in the job, they should be defined or described.

By "Equipment" is meant the tools, machines, and other devices which enable the worker to perform his job. Such items should be distinguished by capitalizing the initial letters the first time they appear in the schedule. All unusual, infrequently encountered items should be underlined the first time they appear in the schedule and should be listed and defined under this subitem. All others should be listed, together with the name of the maker, the model, and the size, but need not be defined. All tools and equipment which are commonly known to the layman, such as saws, hammers, and adding machines, need not even be listed, since they are brought out adequately in the description of the performance of job tasks.

Considerable latitude is allowed in preparing descriptions of equipment, but ordinarily the descriptions must include the following information:

1. Statement of the function of the device.
2. Description of the physical appearance of the device and its essential parts.
3. If a machine, a description of its operation as it relates to the worker.

Only essential features of mechanical equipment should be included in these descriptions. Structural details, such as gear ratio, types of power drive, and similar technical features, need not be included unless the worker has some specific task to perform in relation to them. The analyst should place himself in the position of an observer who stands beside the machine, and should tell what the observer sees and what he would have to know to understand what was being done on the machine. It usually follows then that the description of a completely automatic machine would be considerably simpler than the description of one that required much attention by the worker.

Frequently, for purposes of clarity, it is desirable to follow a typical piece of work through the machine, taking up those operations that have been mentioned in the elements of the Work Performed. The description should be written so as to aid in presenting a picture of the worker in the performance of his tasks. Any special features of, or attachments to, the machine should be mentioned if they have any definite relationship to the worker.

For simpler devices, particularly for handtools, it may only be necessary to include a definition of the device rather than a complete description. However, in every case the purpose for which the device or machine described is used must be explained in the definition.

In the description of the job, it is better to use the generic names of machines and other devices than to use their trade names, unless there is no appropriate, commonly understood generic name. For example, "Automatic Screw Machine" should be used in preference to "Acme Machine." When describing the machines in this section, the generic name should be followed by a parenthetical explanation, giving the trade name of the machine, the name and address of the manufacturer, and any other identifying information that can be obtained, such as model number or size. This enables persons who may later write from the data contained in the schedules to request catalogs and photographs from the manufacturers. Where a drawing has been included in the schedule, and where it is practicable and desirable, an equipment description may be tied in with the drawing by placing letters appearing on the drawing in parentheses after the parts of the device mentioned in the description.

A convenient technique for composing the best type of description or definition of an item is for the analyst to be guided by the following general outline:

1. First state the name of the item.
2. Place the item in its general category.
3. State the function of the item.
4. Describe its physical appearance, its makeup, and its essential parts.

The following are typical examples of the manner in which Equipment is thus described:

"Acetylene Welding Unit (Welding Machine, Style 3-R, manufactured by Hilburn Brothers, Baltimore, Md.): A device used to join pieces of metal by heating their adjacent edges until they are plastic and then fusing them together with metal melted from a welding rod. The equipment consists of an oxygen and an acetylene tank connected by rubber tubing to a torch where the two gases are united. The flow of oxygen and acetylene is regulated by individual valves on each tank and on the torch. The gases, when ignited, burn at the torch tip to produce a flame having a temperature of about 6,300° F."

"Propeller Work Table: A workbench used for dismantling and assembling propeller units. The table is of all-metal construction having four tubular-steel legs and a flat steel top. It is approximately 2 feet wide, 7 feet long, and 3 feet high. Projecting from the surface of the table at one end is an upright spindle which holds the propeller as it is being dismantled or assembled. The propeller is lowered into position on the upright spindle by means of a manually operated hoist. In this position the propeller unit can be easily dismantled or reassembled."

"Caliper: A measuring instrument consisting of two legs which are joined by a hinge or pin. The legs can be separated at their free ends and adjusted to span dimensions to be measured."

"Paddle: A small wooden block about the size and shape of a manicurist's fingernail buffer, used to spread semimolten lead over the interior surfaces of copper pipe. The paddle is impregnated with tallow to prevent the lead from sticking to it."

Care should be taken to see that the use of all equipment noted in this item is clearly indicated in the Work Performed. For example, if a micrometer is defined in this section, and if it does not appear in the Work Performed that the worker measures anything, the presumption is that the task of measuring has been omitted from the Work Performed.

Under the heading "Material" should be listed and described the raw stock that is used up or processed by the worker during the course of his tasks. State what the material is, what purpose it serves, and identify it in relation to the worker. A listing (alphabetically arranged) will be made here only where some physical change in the material involved takes place. For example, a BAKER makes bread from flour and a COREMAKER makes a core from sand, but in the jobs of TAXI DRIVER or ELEVATOR OPERATOR there would be no materials involved. If any items of material need defining because of their unusual or not commonly understood nature, they shoud be underlined the first time they appear in the schedule and should be defined in the listing.

A typical statement under this heading might be the Materials used by an ENGINE LATHE OPERATOR, FIRST CLASS:

Unfinished aluminum and magnesium alloy castings.

Steel and brass bar-stock.

Here also should be included as Material those items which, while not being markedly changed by the worker, are processed by him. For example, a steel beam in which the worker punches rivet holes or a rough casting which is polished would be considered as material.

The analyst often encounters substances which cannot, strictly speaking, be considered either Equipment or Material. Thus, neither the naphtha used by a PROPELLER MECHANIC for cleaning propeller parts nor the sandpaper used to smooth wood by a PATTERNMAKER, WOOD falls under either the category of "Equipment" or of "Materials," although sandpaper does change the shape of the wood somewhat. Substances of this nature should be described here as "Supplies."

Other examples of what might comprise Supplies are the various items of stock handled by a STOCKROOM CLERK. These items are considered to be Supplies, since the worker does not use them to aid him in performing his tasks and does not work on them to change their shape or form. He merely handles them in the routine of this work.

Ordinarily, Supplies do not have to be defined, and only representative ones need be listed. However, if there is some special knowledge required of the worker to process or handle supplies properly, they should be defined in order to bring out better that special knowledge. Similarly, if the nature of the supplies handled affects the job in any way, it should be briefly described. If such items are defined, they should be underlined the first time they appear in the schedule.

Item 21

Definitions of Terms

All unusual or technical terms used throughout the analysis should be underlined the first time they are used in the schedule. The terms thus underlined are to be listed in alphabetical order and defined under this item.

The definitions will vary with the term to be explained, but the definition should explain what the term is, how it is used, and (if an object) what it is used for. The outline of procedure for preparing definitions, as presented in the discussions on "Equipment, Materials, and Supplies," page 27, is wholly applicable to definitions which are to be included here and should be followed for the greatest clarity of presentation.

The analyst must remember that machines, parts of machines, equipment, and tools used by the worker should be described under "Equipment, Material, and Supplies," not under this section.

Examples of the type of entries to be made here are:

Doffing: A general term used to describe the removal of filled bobbins on which wool or other thread is wound.

Phillips Head: The type of head on screws, which has a four-pointed recess as compared with the conventional slotted screwhead.

Weaver's Knot: A small but strong knot used by WEAVERS because it does not slip easily and because it does not show in the finished product.

Item 22

General Comments

The "General Comments" section should be used to footnote all other parts of the job analysis schedule.

It must be remembered that the essential analysis of the job should appear elsewhere in the schedule and that the "General Comments," while important, should distinctly be of an "aside remark" nature.

The analyst must always refer statements made in "General Comments" to the appropriate section of the schedule. Comments which do not relate to specific sections should be headed "General." Appropriate cross-references also must be made in the sections commented upon.

If, for example, the analyst desired to comment on the title of a job, his schedule entry would appear thus on the face sheet:

1. Job Title: MECHANIC (see "Comments").

In "General Comments," the following would appear:

"Item 1: This is a payroll title. The analyst suggests the title of TURRET ASSEMBLER because of the nature of the work performed."

The analyst should remember that this is the footnote item of the schedule and that selected research writing rules apply here. These rules can be stated as:

1. All comments should bear a proper cross-reference.
2. Statements of opinion as opposed to statements of fact should be stated as such and, where possible, the reasoning on which such opinion is formulated should be explained.
3. Information which can appear in other sections should appear there and the "Comments" section should be reserved for "aside remarks."

The following are a few examples of the many types of information which can profitably be entered in this section. All the examples are not applicable to the same specific job but are excerpts from several job analysis schedules.

"General: The job of ENGINE LATHE OPERATOR is divided on the basis of skill into three classes, designated FIRST CLASS, SECOND CLASS, and THIRD CLASS."

"The ENGINE LATHE OPERATOR, THIRD CLASS, is a learner who is promoted automatically to ENGINE LATHE OPERATOR, SECOND CLASS, at the expiration of 6 months' training time."

"The ENGINE LATHE OPERATOR, SECOND CLASS, works on parts involving simple machine setup of a low enough range to be repetitive; maintains ordinary cutting tools, such as cutoff or facing tools; works to liberal tolerances (0.005″) and on materials of low cost, such as castings on which no previous expensive machining has been done. He uses the same precision measuring instruments as the ENGINE LATHE OPERATOR, FIRST CLASS. He is not promoted automatically to ENGINE LATHE OPERATOR, FIRST CLASS, but will be considered for such a promotion after 12 months' experience."

"Promotion To: A SHIP-FITTER LEADER is a SHIP FITTER who, because of his experiences and ability, is temporarily assigned to direct the operations of other SHIP FITTERS on some special phase of the job."

"Task 2: The number of machines set up and adjusted by the worker varies with the production schedules and the number of employees available to tend the machines."

"General: The job's most outstanding characteristic is its repetitive functions. A test to determine applicants' adaptabilities to simple repetitive work might be developed to good advantage for the selection of applicants for this job."

"Work Performed: Axminster weaving differs from other carpet weaving in that the wool for the pile tufts is drawn from several hundred long spools rather than from frames or beams. These spools are carefully wound according to a specified pattern by WINDERS so that there will be one length of yarn for each pile tuft in a repeat pattern. The spools are fitted into the loom in their proper order on a continuous sprocket chain mechanism. In the weaving process, this sprocket chain delivers to the clutch arms of the loom a different spool for each weft row."

PART 6

PHYSICAL DEMANDS

Under "Performance Requirements," four factors, Responsibility, Job Knowledge, Mental Application, and Dexterity and Accuracy, were discussed as being vitally important considerations regarding a job and were designated as having a specific bearing on matters of job classification, job difficulty, and job differentiation. In addition to these four, the factor Physical Demands often proves to be of great importance in rounding out the job picture through its bearing on job difficulty.

Analyses of the physical demands of jobs assist in the placement of all workers, especially the physically handicapped. They are also helpful in the placement of women, youth, and the aged. On occasion, a study of physical demands may uncover job requirements which are stringent enough to preclude the employment of workers normally not considered as handicapped or otherwise limited. In such cases, the physical demands themselves may prove to be the deciding factor in the employment of workers.

This factor is not taken up as a separate item under Performance Requirements but is presented through another portion of the schedule, the Physical Demands Form. From this form the users of schedules are provided with information about the surroundings, hazards, and working conditions of a job which is adequate for descriptive and classification purposes. At the same time they are provided with an integrated description of the physical demands of the job which will meet the requirements of any program involving workers having physical limitations.

It is most important, therefore, that the analyst obtain specific, detailed data concerning the physical aspects of each job analyzed and record such data according to the requirements of the Physical Demands Form.

In making physical demands analyses, the analyst is to make certain that he records the full range of activities required by the basic job. He should be careful to eliminate activities peculiar to an individual or to a special assignment that is not regularly part of the job.

For instance, an ARC WELDER may listen to the sound of the arc to help him maintain the proper arc. The job, however, does not require hearing, but rather vision by which he can observe the process to maintain the proper arc. Likewise, should a worker choose to throw parts into a bin when all that is required is that he carry the parts to the bin and drop them in, carrying rather than throwing would be the required activity.

In preparing his analyses, the analyst must be certain to record all variations found in the physical requirements and working conditions of a job in different job locations. It follows then that there should be as many physical demands analyses for a job as there are positions in the job in different environments and that have different physical requirements. Conversely, of course, there may be instances when one physical demands analysis will serve for several jobs, although a form should be prepared for each job.

In filling out the form, the analyst is to plce an "X" before each activity and condition required by the job and an "O" before each not required by the job. All items are to be thus marked with either an "X" or an "O".

Physical Activities

The purpose of this section of the Physical Demands Form is to provide the analyst with a checklist by means of which he can indicate the presence or absence of physical activities that are required by a job. Included in the list are 27 of the most common physical activities. Items Nos. 28, 29, and 30 provide space for writing in other activities the analyst may encounter, such as a reclining working position. Even resting may be entered here, since often workers are required to rest frequently due to the nature of their work. Definitions of the listed activities are to be found on pages 35 and 36. The analyst must be fully familiar with each definition.

Working Conditions

The purpose of this section of the form is to provide the analyst with a checklist by means of which he can indicate the presence or absence of specific conditions under which a job may be performed. Included in the list are 27 of the most common conditions encountered. These are numbered from 51 to 77. Items Nos. 78, 79, and 80 provide space for writing in other conditions which may be found, such as night shift work. Definitions of the listed conditions are to be found on pages 36 and 37. As with the "Physical Activities" section, the analyst must be fully familiar with each definition.

Details of Physical Activities

The purpose of this section is to describe the relationship of the physical activities required by the job, and to bring out, in a specific manner, the frequency and intensity factors of the activities.

In recording this information, the analyst emphasizes the physical requirements of the job and, unless necessary for clarity, does not describe the duties, equipment, and materials. The analyst should be guided in preparing this section by the following points:

1. *Association of Activities.*—As a result of the activities being presented in checklist form, a schedule user may gather the impression that each item is independent and should be treated separately in writing the details of physical activities. This, however, is not the case. Rarely, if ever, will any one activity stand by itself. For instance, a worker does not stoop without doing something else, such as reach, which, in turn, involves additional activities in order to complete the cycle of physical requirements for a given operation. When writing the details of

activities, therefore, the analyst must bring out the association and flow of activities in order to give the complete picture of the physical requirements of a job.

2. *Specific Treatment of Activities as to Frequency.*—By frequency is meant the time-consuming factor of an activity. The analyst expresses the time factor by placing in parentheses at the end of each statement the percentage of time the activities occupy.

3. *Specific Treatment of Activities as to Intensity.*—By "intensity" is meant the energy-consuming factor of an activity. In order to bring out this factor, the analyst specifically states:

The weight of objects lifted and the distance carried, such as "Crouches and reaches down to grasp, lift, and carry 25-pound metal parts up to 25 feet (10%)."

The names of parts handled, such as "Stands and reaches forward to handle and turn 3-inch valves (5%)."

The body position required in pushing and pulling, the direction pushed or pulled, and the object pushed or pulled, such as "Stands and reaches above shoulder height to grasp and pull electric wires horizontally through ½-inch conduit (10%)."

The distance climbed, jumped, run, walked, or crawled, such as "Crawls up to 100 feet around double bottom of ship in cramped quarters as small as will permit bodily access (10%)."

The percentage figures on the length of time for standing, stooping, crouching, kneeling, turning, and sitting will automatically explain their intensity, such as "Stands and stoops over machine while observing operations (20%)."

The body position required and the direction reached, such as "Stoops and reaches down."

The names of parts fingered, such as ¼-inch nuts and bolts.

The reason why feeling is required, such as to determine the size, shape, temperature, or texture of objects.

If other than ordinary conversation is required in talking, the quality of voice required, such as to enunciate clearly over public address systems, to lecture, or to evoke bids as in auctioneering.

The most difficult sounds required to be heard, such as ordinary conversation, signals amid background noises, motor sounds, musical notes, or heartbeats.

The most difficult object required to be seen at a long distance, such as scanning for fires from a tower; at a near distance, such as reading and checking script for errors.

The colors required to be distinguished, such as red, green, blue, orange, and brown electric wires.

The reason why depth perception is required, such as to judge distances in operating a crane.

The reason why field of vision is required, such as spotting of planes in a 360° range to detect those out of pattern while controling traffic from traffic control tower.

When activities involving the use of the hands and arms and the feet and legs require the use of but one hand and arm and but one foot and leg, the analyst is to make specific comments in this connection.

Typical of the treatment for this section is:

ENGINE LATHE OPERATOR, FIRST CLASS: Stands, stoops, and turns while operating machine (80%); occasionally walks about 10 feet, lifting and carrying chucks and materials not over 30 lbs. (5%); pushes handtruck to transport loads up to 300 lbs. about 75 feet (5%); using both hands, manipulates lathe control handwheels to set controls to fine (1/64 inch) etched gradations (30%); visually and by fingering and feeling, examines finishes on machined parts (5%); stoops to read vernier and other finely etched gradations (30%); orally instructs learners (15%).

This picture of the physical activities is required by the users of the Physical Demands Form to relate the physical capacities of individuals to the specific physical requirements of jobs.

Details of Working Conditions

The purpose of this section is to describe in specific terms the working conditions to which the worker is exposed. In describing these conditions, the analyst makes specific statements regarding the following considerations:

Whether the worker is required to work inside, or outside, or both, such as "Works inside Plate Shop with one side open to weather (80%), and outside in all weather (20%)."

The height of elevated workplaces, such as "Works on a 20′ x 3′ staging 25 feet high (80%)."

The size of cramped quarters, such as "Works in cramped quarters 6′ x 3′ (20%)."

The source of wetness, such as "Works in quarters wet from ground water (50%)."

The range in degrees (Fahrenheit) of high or low temperatures, such as "Exposed to temperatures of 110°–120° (20%)."

The range in degrees (Fahrenheit) of sudden temperature changes, such as "Exposed to sudden temperature changes from about 120° to atmospheric temperatures (10%)."

Whether the humidity is high or low, such as "Exposed to damp temperatures of about 100° (100%)."

The specific kind of toxic conditions, radiant energy, moving objects, mechanical hazards, electric hazards, and explosives, such as "Exposed to black-iron welding fumes (100%)."

The source of vibration, such as "Exposed to vibration from 13-pound pneumatic chipping hammer (40%)."

The source of noise, such as "Exposed to nearby chipping and hammering noises (100%)."

Typical of the treatment for this section is:

ENGINE LATHE OPERATOR, FIRST CLASS: Inside (100%); noisy from operating machines (100%); dirty and greasy from machine and equipment (70%); works with learners (15%) and around other machine shop employees without direct contact (100%); adequate light and ventilation (100%).

Details of Hazards

The purpose of the section is to point out the possibilities of injury to the worker as a result of the hazards inherent in the physical activities and working conditions of a job, in order that activities and exposure harmful to some individuals may be avoided.

In determining the possible injuries the analyst may be guided by considering the following:

Cuts and Bruises
Burns
Sprains
Hernia
Fractures
Loss of Body Parts
Impairment of Sight
Impairment of Hearing
Occupational Diseases
Collapse
Electric Shock

The analyst should make no attempt to express the degree of possible injury other than to state the length of time the worker is subject to such injury. The analyst should also express considerations relative to safety measures operating, such as machine guards, or use of safety shoes, glasses, shields, gloves, earplugs, rubber and leather aprons, and other protective clothing. Users of this information will determine the degree of possible injury as it concerns specific individuals.

As in the previous sections, the time factors are expressed in percentages in parentheses at the end of each statement. As a rule, the percent of time the worker is subject to injury from a physical activity will correspond to the percent of time the worker is engaged in that activity as stated under "Details of Physical Activities." Likewise, the percent of time the worker is subject to injury as a result of exposure to certain working conditions will correspond to the percent of time the worker is exposed to that condition as stated under "Details of of Working Conditions."

Typical of the treatment for this section is:

ENGINE LATHE OPERATOR, FIRST CLASS: Liable to cuts and bruises from machine operations; frequent minor cuts since gloves cannot be worn (80%); subject to first degree burns from accidental ignition of flammable magnesium alloy materials (20%); possibility of hernia and strains from pushing handtruck (5%).

The complete Physical Demands Form accompanying the sample schedules serve to illustrate further the principles of physical demands analysis.

Definitions of Physical Activities

1. Walking: Moving about on the feet by taking alternate steps, setting one foot before the other without running.
2. Jumping: Projecting the body up, down, or horizontally through the air, primarily by the muscular action of the feet and legs.
3. Running: Moving rapidly by using the feet and legs more quickly than in walking.
4. Balancing: Walking, standing, or running on narrow or slippery elevated surfaces by maintaining body equilibrium to prevent falling.
5. Climbing: Ascending or descending ladders, stairs, scaffolding, ramps, poles, ropes, and the like, using the feet and legs or using hands and arms as well.
6. Crawling: Moving about on the hands and knees or hands and feet.
7. Standing: Supporting oneself on the feet and legs in an upright or nearly upright position.
8. Turning: Twisting partly around from a stationary standing or sitting position, usually involving the spine, trunk, neck, and legs.
9. Stooping: Bending the body downward and forward by bending the spine at the waist; not crouching.
10. Crouching: Bending the body downward and forward by bending the legs and spine; not stooping.
11. Kneeling: Bending the legs at the knees to come to rest on the knee or knees.
12. Sitting: Resting upon the haunches or lower or posterior extremities of the trunk as in occupying a bench, chair, saddle, etc.
13. Reaching: Extending the hands and arms in any direction.
14. Lifting: Raising or lowering an object from one level to another; includes upward pulling.
15. Carrying: Transporting an object, usually by holding it in the hands and arms.
16. Throwing: Propelling an object through space by swinging motion of the hand and arm with or without the use of tongs or other devices.
17. Pushing: Exerting force upon an object so that the object moves away from the force, including slapping, striking, kicking, and treadle actions.
18. Pulling: Exerting force upon an object so that the object moves toward the force, including jerking.
19. Handling: Seizing, holding, grasping, turning, or otherwise working with the hand or hands; not fingering.

20. Fingering: Picking, pinching, or otherwise working with the fingers primarily (rather than with the whole hand or arm, as in "Handling").

21. Feeling: Perceiving such attributes or objects as size, shape, temperature, or texture by means of receptors in the skin, typically those of the fingertips.

22. Talking: Expressing or exchanging ideas by means of spoken word.

23. Hearing: Perceiving the nature of sounds by the ear.

24. Seeing: Perceiving the nature of objects by the eye.

25. Color Vision: Perceiving the color of objects by sight.

26. Depth Perception: Perceiving relative or absolute distances of an object from the observer or from one object to another.

27. Working Speed: The rate of speed the job requires of the worker. This item is checked with an "X" only where the job requires a significantly high rate of working speed.

Definitions of Working Conditions

51. Inside: Indoor protection from weather conditions.

52. Outside: Out of doors, or under an overhead covering with slight protection from the weather.

53. Hot: High temperature causing perceptible bodily discomfort.

54. Cold: Low temperature causing perceptible bodily discomfort.

55. Sudden Temperature Changes: Marked or abrupt variations in temperature causing perceptible bodily reactions.

56. Humid: Atmospheric condition with high moisture content causing perceptible bodily discomfort.

57. Dry: Atmospheric condition with low moisture content causing perceptible bodily discomfort.

58. Wet: Contact with water or other liquids.

59. Dusty: Air filled with small particles of any kind, such as textile dust, flour, wood, leather, and feathers, and inorganic dust, including silica and asbestos, which make the workplace unpleasant or are the source of occupational diseases.

60. Dirty: Contact with or exposure to dirt, litter, soiled materials, etc.

61. Odors: Perceptible smells, either toxic or nontoxic.

62. Noisy: Constant or intermittent noises causing thought distraction or possible injury to sense of hearing. (See chart on p. — in appendix — for examples of sound levels measured in decibels.)

63. Adequate Lighting: Sufficient lighting to minimize eyestrain. (A zero before this item would indicate the lighting is either insufficient or excessive. Explain under "Details of Working Conditions.")

64. Adequate Ventilation: Ventilation causing neither a feeling of suffocation nor exposure to drafts. (A zero before this item would indicate that the ventilation is insufficient or excessive. Explain under "Details of Working Conditions.")

65. Vibration: Production of an oscillating or quivering movement of the body or strain on the muscles, particularly of the legs and arms, as from repeated motion, pressure, or shock.

66. Mechanical Hazards: Exposure to materials or mechanical parts involving the risk of bodily injury.

67. Moving Objects: Exposure to moving equipment and objects, such as overhead cranes, hand- and motor-driven vehicles, and falling objects, which involve the risk of bodily injury; also the act of operating such equipment.

68. Cramped Quarters: Workplace where freedom of movement is restricted or where worker cannot maintain an upright position.

69. High Places: Workplace at an elevation above the floor or ground level from which it is possible to fall and be injured.

70. Exposure to Burns: Workplace involving the risk of being burned from hot materials, fire, or chemical agents.

71. Electrical Hazards: Exposure to high-tension wires, transformers, bus bars, or other uninsulated or unshielded electrical equipment which involves the risk of electric shock.

72. Explosives: Exposure to explosive gases, vapors, dusts, liquids, and substances which involve the risk of bodily injury.

73. Radiant Energy: Exposure to radioactive substances (radium, uranium, thorium, etc.), X-rays, ultraviolet rays, or infrared rays which involve the risk of impairment of sight or general or localized disabling conditions.

74. Toxic Conditions: Exposure to toxic dusts, fumes, gases, vapors, mists, or liquids which cause general or localized disabling conditions as a result of inhalation or action on the skin.

75. Working With Others: Job requires occupational cooperation with fellow workers or direct contact with the public.

76. Working Around Others: Job requires independent occupational effort but in proximity to fellow workers or the public.

77. Working Alone: Job requires independent occupational effort and virtually no contact with fellow workers or the public.

V

STEPS IN ANALYZING JOBS IN AN ESTABLISHMENT

This portion of the manual describes the procedures usually followed by an analyst in conducting job studies and the methods used to secure detailed, valid, and authoritative occupational information.

Preparing for the Analysis

The analyst should familiarize himself, prior to entry into the establishment, with the processes of the industry and jobs which are likely to be encountered. Several sources of information that are helpful for orientation are:

1. The library for books, periodicals, or other literature concerning the particular industry or occupational area to be studied.
2. The company in which job studies are to be made for catalogs, flow charts, organization charts, and process descriptions.
3. Trade associations, professional societies, trade unions, and similar organizations for technical literature on industrial processes, job descriptions, and experts for consultation.
4. Federal, State, and municipal government departments which have interests in the industry or occupational area; e.g., health, agriculture, labor, commerce as sources for pamphlets, books, job descriptions, and consultation with experts.

Such preanalysis study of an industrial or occupational activity will help the analyst gain the respect and cooperation of management, supervisors, and workers. Good background preparation will save time and will eliminate the necessity for asking questions on elementary points. It will enable the analyst to interview and observe more quickly and intelligently. Background information should provide vocabulary and knowledge about what is observed and discussed but should not bias the analyst. The analyst must get the facts about the jobs as they exist, not as they once were or as they may exist in the future.

The analyst should also be aware that it is possible to "over research" an industrial or occupational activity and that the preanalysis study could become an end itself; the analyst should confine himself to obtaining information about the basic activities of the industry or occupation.

Arranging for the Analysis

It is essential that all sources of job information in an establishment be utilized to the fullest extent so that accurate and complete job information can be obtained. To assure the attainment of this objective, it is necessary for close cooperation to exist between the analyst and plant management. Consequently, the analyst must avoid any causes of friction or misunderstanding.

Arrangements for the analysis must be made with the plant management before it can be started. If no job studies have been made in the establishment before, contact will usually be made with the head of the establishment or, in large establishments, with the personnel director. Sometimes it may be necessary to visit the company official who has jurisdiction over such matters as contacts with Government agencies. These details, of course, can be determined locally.

The important object of the first contact is to assure that management understands the aims of the study and that proper authorization for the study is secured. Frequently, aid in gaining the approval for a study can be had by showing management how the results of the job analysis can be applied directly to its own problems of personnel management or industrial relations. To do this it is first necessary to determine the operating policies of the establishment with respect to job analysis. That is, does the establishment already have some system of job analysis or of making job descriptions that it uses in the solution of its problems?

If it is determined that no program of analysis exists, the approach is to determine any problems the establishment is encountering, such as problems of recruitment, turnover, or utilization. The analyst can then indicate means whereby the analyses prepared during the study can aid in the solution of these problems. If management is convinced that the analyses prepared in the establishment can be of a real and definite aid in operations, cooperation is more likely to be given in the study than if management feels that the study is merely to be tolerated. In establishments using organized labor, a complete explanation of the study should be made to the officials of the labor union.

Whenever possible, arrangements should be made so that a tour of the establishment is made prior to beginning the actual analysis of jobs. This is highly desirable in order that the analyst can obtain a general overall picture of operations, familiarize himself with the general process, and gain a knowledge of the flow of work within the establishment. The knowledge gained from such a tour does much to help the analyst in planning his approach to the study.

The officials with whom the tour is made will usually introduce the analyst to the foremen or heads of the departments where the analyses are to be made. The analyst should explain briefly to each foreman the major objective of the analysis. If the study is being made for special purposes that will assist the company in solving personnel problems, these purposes also should be mentioned. The analyst also should explain that he is not concerned with wages and hours, labor-management relations, or the quantity and quality of the work produced, but is concerned solely with those factors which pertain to the selection of workers. If not already familiar with factory regulations concerning visitors, he can determine from the foremen the rules to be followed. The analyst should have identifying credentials, particularly when visiting new establishments or new departments.

Planning the Analysis

In order for the analyst to conduct his studies as efficiently and expeditiously as possible, he should have a plan of operations for his guidance. While such a plan naturally will vary in detail from establishment to establishment, it is possible to devise a general approach to the plan which will be uniform for all establishments.

Following the tour the analyst should request of management specific information regarding the departmentalization of the establishment, the job titles of all jobs in the various departments, and the number of workers employed in each job. This information will probably be supplied by either the personnel department or the payroll department since, generally, these are the departments where such data are accumulated on an establishmentwide basis. If the data are furnished by the personnel department, they will probably be on a much more realistic basis, so far as the work performed is concerned, than if furnished by the payroll department which, for its operations, frequently prefers to title and group jobs on other bases.

Regardless of the source and type of information, the analyst should organize it so that it gives the best preliminary picture of the composition of the establishment by departments and of the departments by jobs. The arrangement of the information found to be the most useful for planning purposes is that of the Staffing Schedule and Job Analysis Planning Report form. On it the analyst should record such information as the name of each department, the titles of all jobs in each department, the total number employed in each job, the titles and code numbers from the *Dictionary of Occupational Titles* that correspond to each department job title, and the treatment to be accorded each job. For planning purposes the analyst should complete the form in the manner described in chapter IX for completing the Job Analysis Planning Report.

With such a preanalysis plan prepared, the analyst can save much time in the departments, for he will have noted tentatively the probability for eliminations and noted definitely the duplications. The analyst must remember, however, that such a plan is only preliminary and he must verify his first planning against actual conditions in the departments. Nothing can be more subject to error than the assumption that a job title is indicative of the actual tasks of the job.

In supplementing the plan he has laid out, the analyst should obtain all assistance possible from the department heads or foremen. He should compare with them Dictionary definitions and the plant jobs he believes are covered, and he should recheck with them apparent duplications between departments. At this time the exact titles for the jobs can be verified and any other names by which they are known can be recorded as alternate titles.

Anticipating the analyses he will make, the analyst should attempt to secure from each foreman an overall picture of departmental operations and relationships, and to determine the relationship of each job to the departmental or plant process. He should also ask the foremen to direct him to work situations where the work performed is typical of the jobs to be analyzed.

Note Taking

To discover the contents of jobs through the "What," "How," and "Why" of the tasks performed and "Skill Involved" in those tasks, the analyst must be alert and attentive while making job observations and conducting interviews. He should have the job analysis schedule form firmly in mind as a reminder of the items to be covered in the analysis. Throughout the studies, the workbook "Guide for Analyzing Jobs" should be carried as a constant reference for indicating the considerations applicable to the information to be obtained. A small notebook is valuable for recording notes while observing the jobs and interviewing plant officials, supervisors, or workers. The extent of the note taking varies with the individual analyst or with a given situation. If an analyst is thoroughly familiar with a job or an industrial situation, he may need very few notes. Some industrial firms may not permit note taking for various reasons, such as the nature of product manufactured, particular methods or processes employed, or machinery used. Some workers may object to records being made of their conversation. Some may become nervous and upset, but others may feel that their jobs are more important to the analyst because he does take notes.

Suggestions for effective note taking:

1. The analyst should take notes after he has determined the purpose of the job and has identified the basic work pattern or major steps or cycles that characterize the job.

2. Notes should be kept to a minimum and should contain only the data necessary to prepare acceptable job analysis schedules.

3. The analyst should record the data he will have difficulty remembering, such as major steps or functions, technical terms, descriptions of tools and equipment, descriptions of tasks that seem complicated.

4. The analyst should record only the facts about the job, concentrating on the "What," "Why," and "How" of the job and "Skill Involved" and avoiding personal opinions reflected by such judgmental words as "monotonous," "uninteresting," "pleasant," or "distasteful."

5. The analyst should take notes, when possible, during the course of the observation or interview, or as soon as possible after the job observation or interview.

6. Notes should be written up as soon as possible after the observation or interview while the data can be readily recalled.

Getting Job Information by Observation-Interview Method

This method involves analyzing jobs by observing workers performing their jobs and interviewing workers, supervisors, and other plant personnel who have information pertinent to the jobs. It is the most desirable method for analyzing jobs because it involves firsthand observation by the analyst, enables the analyst to evaluate the interview data and sift essential from nonessential facts in terms of that observation, and permits the worker to illustrate facts about the job by demonstration rather than depending entirely on more difficult oral or written communication.

The analyst may use this method in two ways: (1) He observes the worker on the job performing a complete work cycle before asking any questions. During the observation he takes adequate notes and indicates those job activities which he does not fully understand. When he is satisfied that he has accumulated as much information as he can get from observation, he talks with the worker or supervisor or both to supplement his notes. (2) He observes and interviews the worker simultaneously. As he watches, he talks with the worker about what is being done and asks questions about what he is observing as well as conditions under which the job is being performed. Here, too, the analyst takes notes in order to retain all the data pertinent to the job and its environment.

In jobs such as assembling or inspecting small parts, the basic work cycle may be completed in several minutes and is relatively easy to grasp and organize for presentation in the Work Performed. Here the analyst should observe the complete cycle first, and then ask questions of the worker, his supervisor, and others to obtain needed information. There will be other jobs, however, such as FLOOR MOLDER or MILLING MACHINE OPERATOR, having work cycles so complex they may extend over several days and be difficult to understand through short observations. Information related to the work cycles in these jobs can be obtained by using one of several different approaches: (1) By observing the job in different stages of process at several different work stations and organizing the various job tasks into a logical sequence; (2) arranging for more than one visit to observe the worker action at different stages in the work cycle; and (3) by interviewing the worker or his supervisor to obtain data for steps in the work cycle that were not observed.

Securing Information by Interview

In some instances it may be impossible to observe the worker performing his tasks because of security reasons, reluctance on the part of management to allow the analyst to observe the manufacturing process, or because of the complex and protracted nature of the work cycle. In such cases the worker and his supervisor should be interviewed in a place away from the worksite. It is believed that this interview should be guided, insofar as possible, by the general formula of job analysis procedure; i.e., the "What," "How," and "Why," and "Skill Involved" in the job. It is here that the analyst's workbook should be especially valuable in guiding him in obtaining the type of information listed under the formula.

The interview is a conversational interaction among the analyst and the worker and the worker's supervisor to obtain all the facts necessary for job analysis. The amount and the objectivity of information the analyst receives depend in large part on how much he contributes to the situation. A good background preparation will save time and will enable the analyst to interview more quickly and intelligently. The analyst must treat the interviewee as a person, establish friendly relations in a short time, and be sufficiently detached to be objective and free of bias. He must be sure to secure all pertinent information needed for the items contained in the schedule form. He must make certain that workers selected for interview know their job well. The following suggestions will assist analysts in effective and complete data gathering:

1. *Opening the interview.*—Put the worker at ease. Learn his name in advance and introduce yourself. Discuss general and pleasant topics only long enough to establish rapport. Make the purpose of the interview clear. Tell the worker why the interview was scheduled and what is expected to be accomplished. Assure him that the analysis is not concerned with time study or wages. Get the worker to talk. Be courteous and show a sincere interest in what he says.

2. *Steering the interview.*—Encourage the worker to think and talk according to a logical sequence of the duties performed. If duties are not performed in a regular order, ask the worker to describe the duties in a functional manner in order of their importance with the most important activity first. Request the worker to describe infrequent duties that are not part of his regular activities; e.g., occasional setup of a machine, occasional repairs, or infrequent reports. Infrequently performed duties, however, do not include such activities as taking an annual inventory in which all or most employees assist or emergency unloading of a freight car. They do include duties that occur where work is seasonal, such as a Machinist who is assigned temporary work as a Building-Maintenance Mechanic during off-season periods to give him work and allow him to keep his seniority status. Let the worker talk sufficiently. Allow him sufficient time to formulate an answer, and answer the question. Ask one question at a time. Phrase questions carefully so that the worker must answer more than "yes" or "no." Do not ask leading questions. Secure specific and complete information for the job analysis schedule form. Secure information concerning what the worker does, what gets done, and what the worker uses in performing his work, such as materials, machines, tools, equipment, and work aids. Obtain information about the job requirements, such as worker responsibility, job knowledge, mental application, dexterity and accuracy, physical demands, and working conditions. Differentiate between what the worker does and what the machine does. Conduct the interview in language understood by the worker. Consider the realtionship of the job under analysis to other jobs in the department. Control the interview with respect to economical use of time and adherence to subject matter. For example, when the interviewee strays from subject, a good technique for bringing him back to the subject is to summarize the data collected up to that point. Do not exhibit impatience if the worker is nervous or ill at ease.

3. *Closing the interview.*—Summarize the information obtained from the worker indicating the major duties performed and the details concerning each of the duties. Close the interview on a friendly note.

4. *Miscellaneous.*—Do not take issue with the worker's statements. Do not show any partiality to grievances or conflicts concerning employer-employee relations. Do not give any indication as to, or show interest in, the wage classification of the job. Show politeness and courtesy throughout the interview. Show an impersonal attitude. Do not be critical or attempt to suggest any changes or improvements in organization or methods of work. Do not "talk down" to the worker. Respect the judgment of the worker. Do not be influenced by personal likes and dislikes. Talk to the worker only with the permission of his supervisor. Verify job data, especially technical or trade terminology, with the foreman or department head. Verify the completed analysis with the proper official. Express appreciation to those who have granted the interview.

The interview to which the analyst resorts is simpler than most in that he has only one variable in the information he seeks. This is the job itself. If the analyst is completely grounded in the type of information required about the job, he can phrase his questions along specific lines. If he has a sound concept of the format of the Job Analysis Schedule, he should have little difficulty in organizing his interview. Therefore, the first approach to the interview is for the analyst to know the Job Analysis Schedule thoroughly and to keep it constantly in mind while conducting the interview.

Summary of Procedure

The following points summarize the procedure for obtaining good occupational data through job analysis and maintaining good relationships while studying the jobs.

1. The proper official should be contacted for permission to make the study and his assistance should be requested in planning the program of study, the jobs on which to start, the personnel to work with in each department, and the order to be followed.

2. The official should notify the heads and the foremen of the departments affected of the purposes of the study.

3. The names of all the analysts engaged in the study should be sumitted and, when necessary, passes should be obtained for them.

4. The foreman should be consulted regarding the best job station in which to observe typical tasks and on which there are workers who will not be disturbed by being observed. The foreman should explain to the workers the purpose of the observation.

5. Prior to observing the job, the analyst should obtain an overall picture of the operations through discussion and plant tour, and should determine each job's relationship to the entire process.

6. The analyst also should—

    (*a*) Note and differentiate between what the worker does and what the machine does.

    (*b*) When possible, observe the tasks of the worker from the time a unit of work has begun until it has been completed; i.e., a complete work cycle.

    (*c*) Talk to the worker only with permission of the foreman and then as little as possible in order not to disturb him.

    (*d*) Unobtrusively take a minimum of notes while observing the job and expand them as soon afterward as possible; repeat the observation if necessary.

    (*e*) Observe the job before obtaining from the hiring official the qualifications, information on job relationships, and other information which cannot be obtained by observation.

    (*f*) Check job data, especially technical or trade terminology, with the foreman or department head.

    (g) Verify the completed analysis with the proper official.

7. On completion of the plant study, a note or letter of appreciation should be directed to the plant management for all courtesies and cooperation given to the analyst.

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VI

THE NARRATIVE REPORT

The mere analysis of a group of jobs in a single study does not complete the work of the analyst. To introduce the job analysis schedules into the common fund of occupational knowledge and to facilitate their use as basic sources of occupational information, the circumstances under which the jobs existed at the time of study must be described in a report. This report is the narrative report which serves to orient the reader of schedule material before he begins a study of the schedules themselves. The narrative report also offers opportunity to present occupational information which, because of its nature, cannot be presented on the basis of individual job schedules.

CHARACTERISTICS OF A GOOD NARRATIVE REPORT

In general, the characteristics of a good narrative report are the same as those of any good report. These may be stated:

1. The purpose of a technical report is to convey a set of facts to the reader. The report is successful only to the extent that it accomplishes that end.
2. The report must possess clarity and accuracy.
3. A prerequisite of a good report is that the writer of the report has a clear understanding of the material he presents. The report should be thought out thoroughly in advance of writing.
4. The material should be complete and selected carefully with its purpose in mind.

A standard formula for the writing of reports is neither possible nor desirable. The objective here is to present a guide to effective report writing which will not be too restrictive yet which will improve the quality and bring a degree of uniformity to reports.

COMPILING MATERIAL FOR THE REPORT

The information in the narrative report is acquired through interviews with management and placement officials, study of technical journals and similar materials, observation of work, and review of the completed schedules themselves. In short, the material in the narrative report is not obtained as a special project but is accumulated during the job analyses. The analyst should have his narrative report in mind all during the study in order to build up his source material.

The process of collecting data for the report, therefore, cannot be separated from the rest of the work of the analyst. From the time the analyst begins his study by reading and by taking plant tours, he should start recording information he has obtained that can be used in the report. While he is observing jobs and interviewing personnel, he should note facts that are pertinent to the report, and he should make any additional inquiries necessary to clarify plant organizations, overall job relationships and policies, processes, hazards, and the like. He should remember that any "background" information required to make the analyses also is needed to understand them.

When the plant study is complete, the analyst should find that his only problem in preparing the report will be the problem of organizing his source material and writing the draft. The content of the report itself is best described under the discussion of its organization and arrangement.

ORGANIZATION AND ARRANGEMENT

The arrangement of material for each report should be approached as a separate problem. The final arrangement of the narrative report is dictated by the general nature of each study that requires a report. However, the broad arrangement should be based on a nucleus of information without which no report would be complete. This nucleus will provide the general headings under which the report is written, but will not prescribe the subdivisions dictated by circumstances under those headings.

Generally, the arrangement of material under the broad headings will vary according to the amount of the material and according to the importance of the material from the standpoint of providing the reader with usable information. Clarifying headings should be introduced into the text whenever necessary. If the report is a long one, a table of contents should be included.

Headings

Since the report is only a portion of the job analysis study, the heading need include only the establishment number for identification. The establishment number includes an estimate of the number of employees in the plant, information which need not be duplicated elsewhere in the report.

Purpose of Plant

This is a statement of the work or service of the plant. It should include a discussion of the raw material received, the process by which the material is converted, and the final product itself. It may include a discussion of other processes not used by the plant which will clarify the relation of the establishment to the industry. Process charts are of assistance in explaining the purpose, or reference may be made to publications which contain descriptions of the process. (Construction of charts is explained on p. 53.) In this, as in other sections of the report, the analyst should include information which has assisted him in his own work.

Plant Environmental Factors

These include equipment, general hazards, physical requirements, and working conditions peculiar to the industry. They also include conditions peculiar to the establishment, such as the size or layout of plant, or any restrictions which affected the study and, therefore, the schedules. They should be concerned with the overall plant picture and should avoid information applicable to the individual jobs, because such information is contained in the schedules. Recent technological changes that have resulted in the elimination of some jobs and changes in others may be discussed here.

A job analysis study may be conducted as part of a comprehensive study of the effects of the introduction of automation. Under such circumstances, the narrative report will include more details, such as number and kinds of jobs eliminated, changed, or created. Charts should be constructed showing the organization before and after automation.

Plant Placement Policies

Here the analyst should give a picture of the industry or plant methods which are of vital concern to occupational technicians. He should include the types and methods of training either employed by the company or on which the company relies. Sources and types of workers, to which the plant has recourse, are of direct interest. Employment of such labor groups as women, handicapped, or minority groups should be described. Upgrading, job engineering, and other labor utilization techniques are of interest in occupational analysis work. Under normal conditions the industrial employment prospects also provide usable information. The following questions relate to plant placement policies which have provided information of value to Employment Service programs as well as to personnel workers:

Relating to Training.—Is there a formal in-plant training program? How does it operate? Are there outside facilities to which the plant has recourse? Are there formal apprenticeships in effect? What are the entry occupations in this plant? What are the proportions of skilled, semiskilled, and unskilled workers in the plant? Has job reengineering created new entry occupations or lowered the skill requirements of the nonentry jobs? How has the introduction of automated or highly mechanized processes affected the plant training program?

Relating to Upgrading.—To what extent has upgrading been effected in the plant? Are there definite promotional lines? What and where are the dead-end jobs? Is there formal supervisory or foreman training? Are there promotions within jobs, for example, from ELECTRICIAN, SECOND CLASS, to ELECTRICIAN, FIRST CLASS? What are the upgrading possibilities for women, the handicapped, and minority workers?

Relating to Employment of Women.—What openings for women are there in this establishment? Are there environmental factors which negate successful employment? What is the establishment attitude toward their employment? Have jobs been reengineered to facilitate their employment?

Relating to Employment of Handicapped Workers.—Where and in what types of work are they employed? Has the establishment investigated the possibility of increasing this type of employment? What are the results of such attempts?

Relating to Employment of Members of Minority Groups.—Are there limits to the employment of these workers? To their upgrading? Are there jobs or departments which do not employ minority workers? What are the jobs or departments which do afford employment? What is the employment trend in this respect?

Relating to Job Reengineering.—What possibilities along this line have been explored by the company? Are there factors which limit the possibilities? What have been the results of reengineering? Has it contributed to the solution of labor utilization problems?

Plant Organization

The plant organizational setup gives necessary orientation to the schedule reader, particularly where such schedules do not cover a complete plant. Organization charts will assist in showing the relationships among departments of the plant. Their construction is discussed on page 48.

Subnarratives

These are narratives of the department or divisions into which the establishment is divided. They should include the same type of information as the narrative itself, except that the information should apply specifically to the department. The organizational setup should be described in terms of jobs, with the jobs covered by schedules clearly distinguished from those not covered by schedules. The jobs not covered should be identified by a brief statement of duties or by the corresponding *Dictionary of Occupational Titles* title and code. The reason why jobs have not been covered should be explained. The general arrangement of the subnarrative should be the same as for the narrative.

Appendix

The analyst, in the course of his study, probably will have found technical publications, trade periodicals, or other publications to be valuable. These should be included in a bibliography. Additional material which the analyst has secured from management to assist in the study should be included in other appendices. The analyst should omit nothing that he has found helpful in his own work.

WRITING THE REPORT

Writing a narrative report is the process of converting the information secured into usable reference material. Standards of writing are those standards required to write complete information necessary to accomplish its purpose, to include only the essential information in the fewest words consistent with clarity or proper arrangement of exposition, and for accuracy of word usage. English usage is explained in textbooks devoted to that purpose and will not be discussed here. These instructions will include only those mechanics of particular interest to report writing.

Differentiating Between Fact and Opinion

The analyst should distinguish clearly between statements based on fact and those based on his own or others' opinions. There is no objection to statements of opinion if they are so labeled. In fact, such statements enhance the value of the narrative report in rendering an overall picture of the study. But where such statements are made, their source should be indicated by some such statements as "In the analyst's opinion . . ." or "The personnel manager states that . . . ." Crediting a statement thus, while indicating that the statement is not substantiated completely, gives the authority for the opinion and lends weight to it. If the authority is in a good position to express an opinion, the statement assumes added importance

Paragraphing

As a unit of expression, a paragraph must be built around one central thought. Sentences not contributing to that thought unit do not belong in the paragraph. Since, however, breaks between paragraphs serve as resting points for the reader, long paragraphs of more than 200 or so words should not be used.

The relationship between contiguous paragraphs should be clear. Suitable transition statements are necessary for the reader to follow the changing thought from paragraph to paragraph. Even where main headings and subheadings are used, the transition should be such that the reader understands that he has completed one thought and is progressing to the next.

Because of its position of emphasis, the opening sentence often is used to state in summary form the central thought which the remainder of the paragraph expands and supports. At other times it points the direction which the new paragraph will take away from the preceding paragraph. In any case, the emphatic positions of the first and the last sentences in the paragraph should not be wasted by the writer.

Use of Subheadings

Headings serve two purposes. First, they reveal to the reader the organization of the report and the scope and content of each section. They aid ready reference to particular sections of the whole report in which the reader may have an interest. Second, they help sustain reader interest and avoid fatigue by breaking the monotony of solid text. They also aid in transition of thought.

General headings for a report have been described under "Organization and Arrangement." Subheadings should be inserted by the analyst at his own discretion, and their liberal use should be encouraged. However, the analyst should make sure that the subheadings as written are clearly subordinate. It would be well for the analyst to evolve a specific system of headings for his own use.

The main headings may be centered and underlined. Secondary headings then can be placed at the left margin and underlined. Third-order headings (usually to be avoided) might be run into the text and underlined. "Label" headings should be avoided. For example, while "Plant Environmental Factors" is adequate for a very broad heading, a subheading under it should say: "Physical Layout of Departments," rather than "Layouts." The format in any case should be consistent.

ORGANIZATION AND PROCESS CHARTS

Organization charts and process charts provide very useful information in a very limited space; therefore, a brief discussion of the construction of such charts is included here. Where such charts are used, cross-references should be made to them at appropriate points in the text of the narrative report itself.

When preparing charts in the field, the analyst should not attempt to turn out an elaborate finished product. A freehand pencil chart is adequate if it is clear. The analyst should concentrate primarily on accuracy and clarity rather than on time-consuming attempts at artistic presentation.

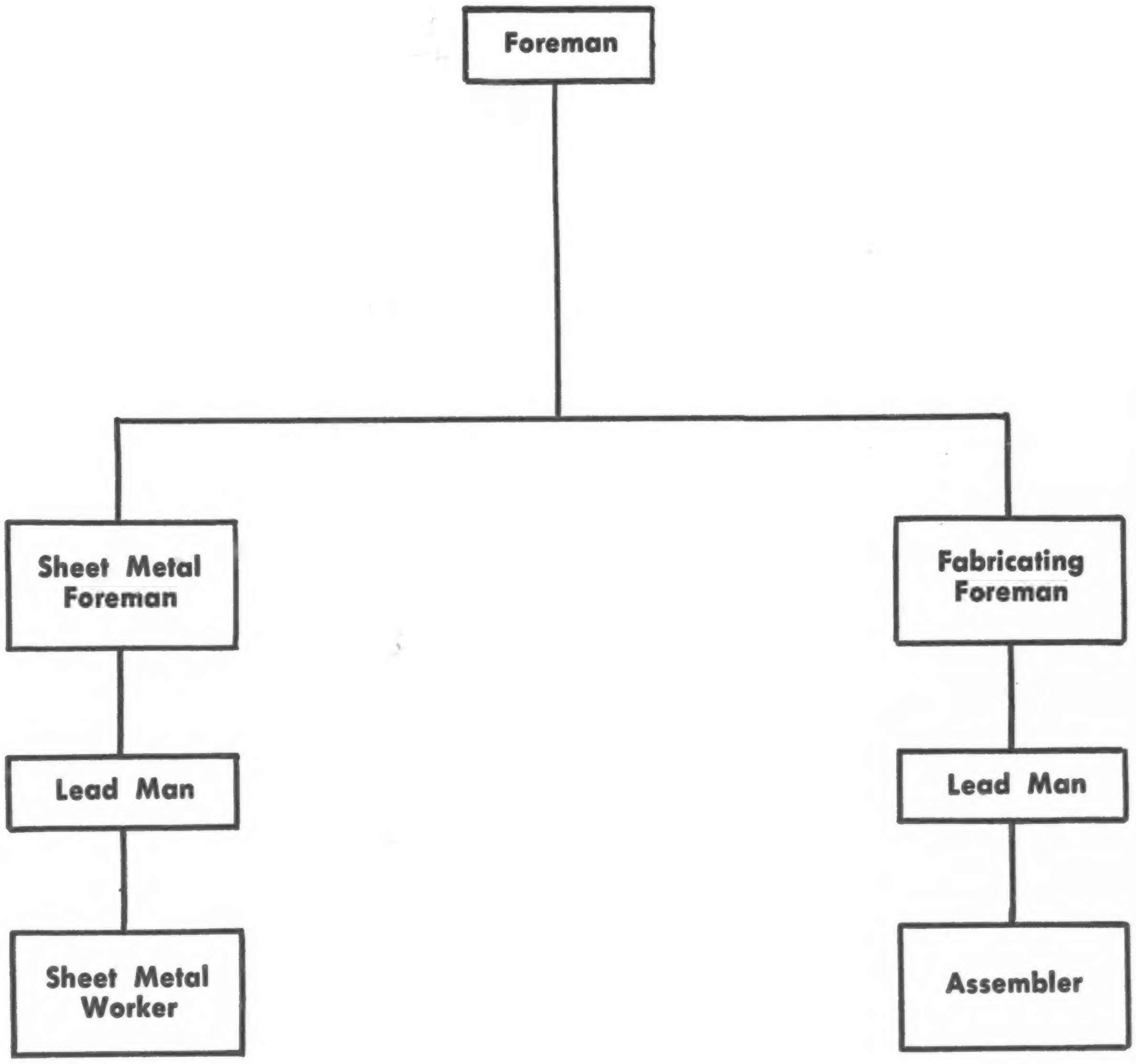
Organization Charts

An organization chart shows graphically the type of organizational setup and the relationships between its subdivisions. When organization charts accompany a narrative report, generally two types should be used. The first would be an overall chart of the organization showing the relationships between subdivisions. The second would be charts of the subdivisions covered in the subnarratives showing the relationship between jobs within each subdivision. A simple way of developing such charts is to write on separate slips of paper the single units which will comprise the chart, arrange these slips in descending order of authority, and place the units which represent the same level of authority side by side. The resulting layout can be sketched easily in rough draft and the relating lines drawn to connect the units.

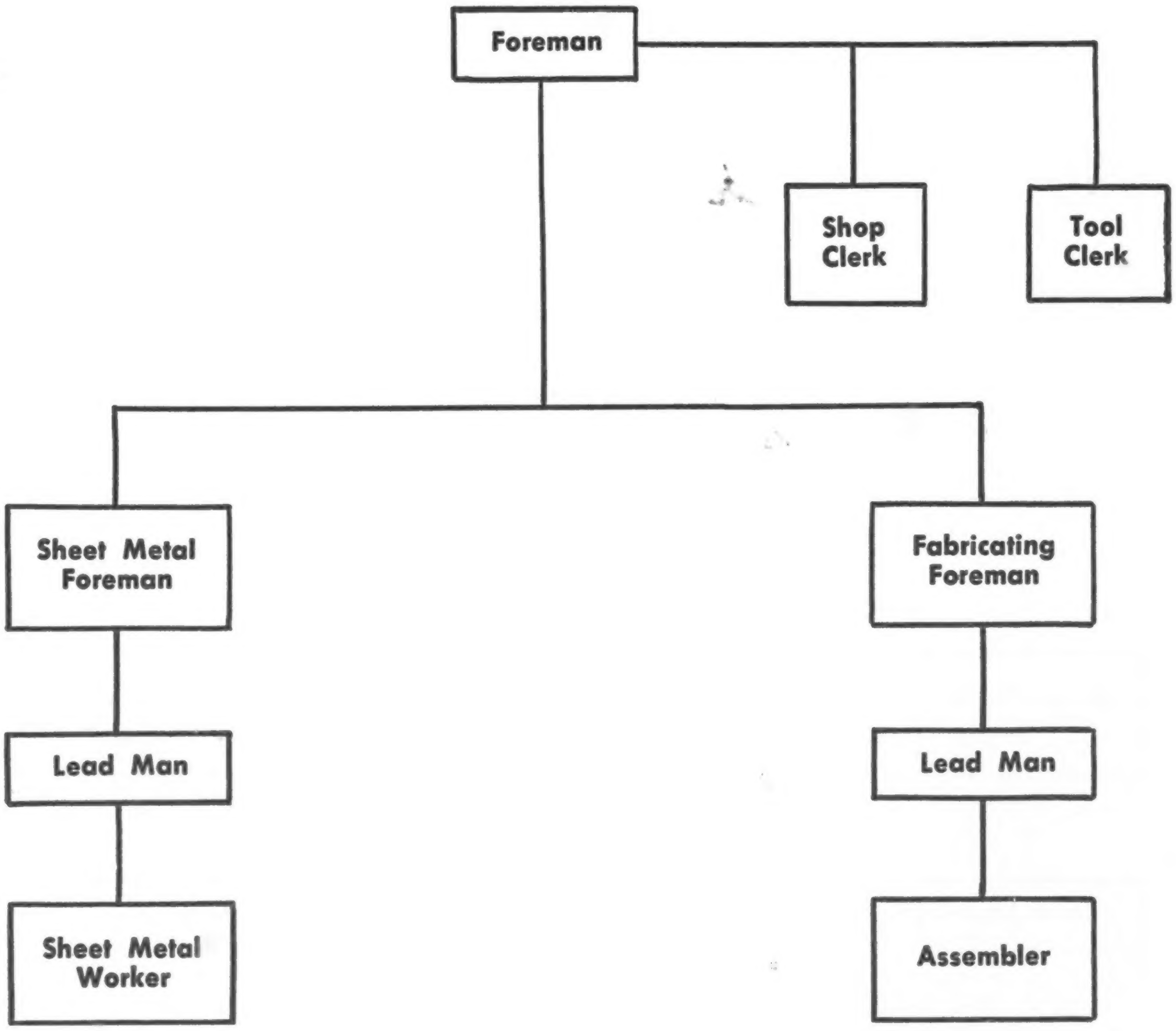
Basically there are three types of organization structures, and a given organization will exist as any one or in combination. These are:

1. Line organization in which all authority travels directly from one unit to the next.
2. Line-staff organization which superimposes on the line organization a staff that does not participate directly in operations but provides technical assistance required by the operating units. This type of organization is typical of governmental units.
3. Functional organization in which lines of authority may descend in several paths, each path representing a single function of the operations. A common example of this type exists in those concerns that have standards departments which are responsible for all inspection work but which exercise no control over other operating functions.

The construction of a chart of the organization for a small hypothetical Airplane Assembly Department will illustrate these points. The department consists of both sheet metal and fabricating units each supervised by a Lead Man who, in turn, is supervised by a Foreman. The line organization could be constructed thus:

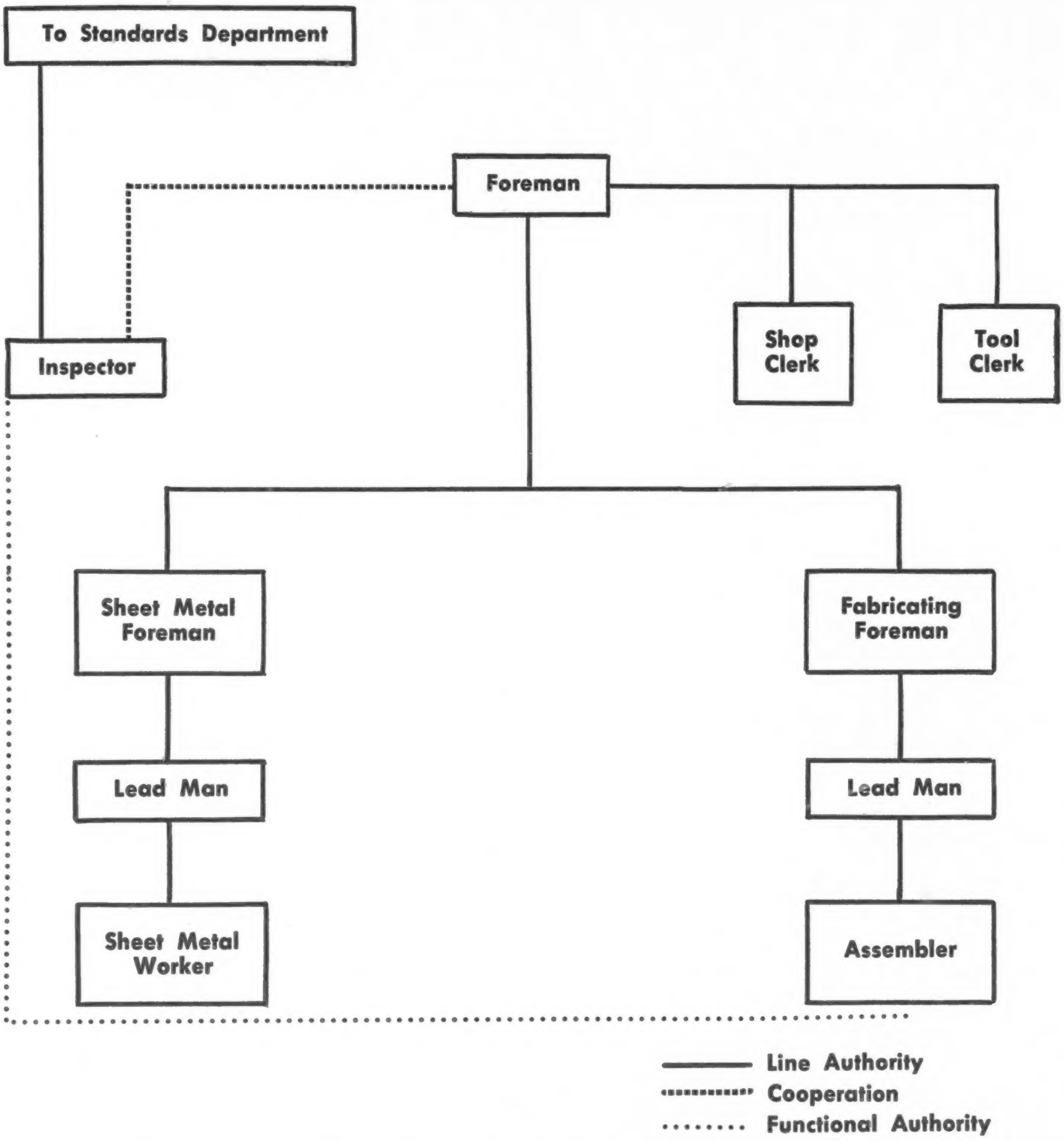

Foreman
Sheet Metal Foreman
Fabricating Foreman
Lead Man
Lead Man
Sheet Metal Worker
Assembler

In addition to the "Line" organization, the Foreman has a small staff which assists in special phases of the work without direct connection to the line organization. The two "staff" functions are added to the chart.

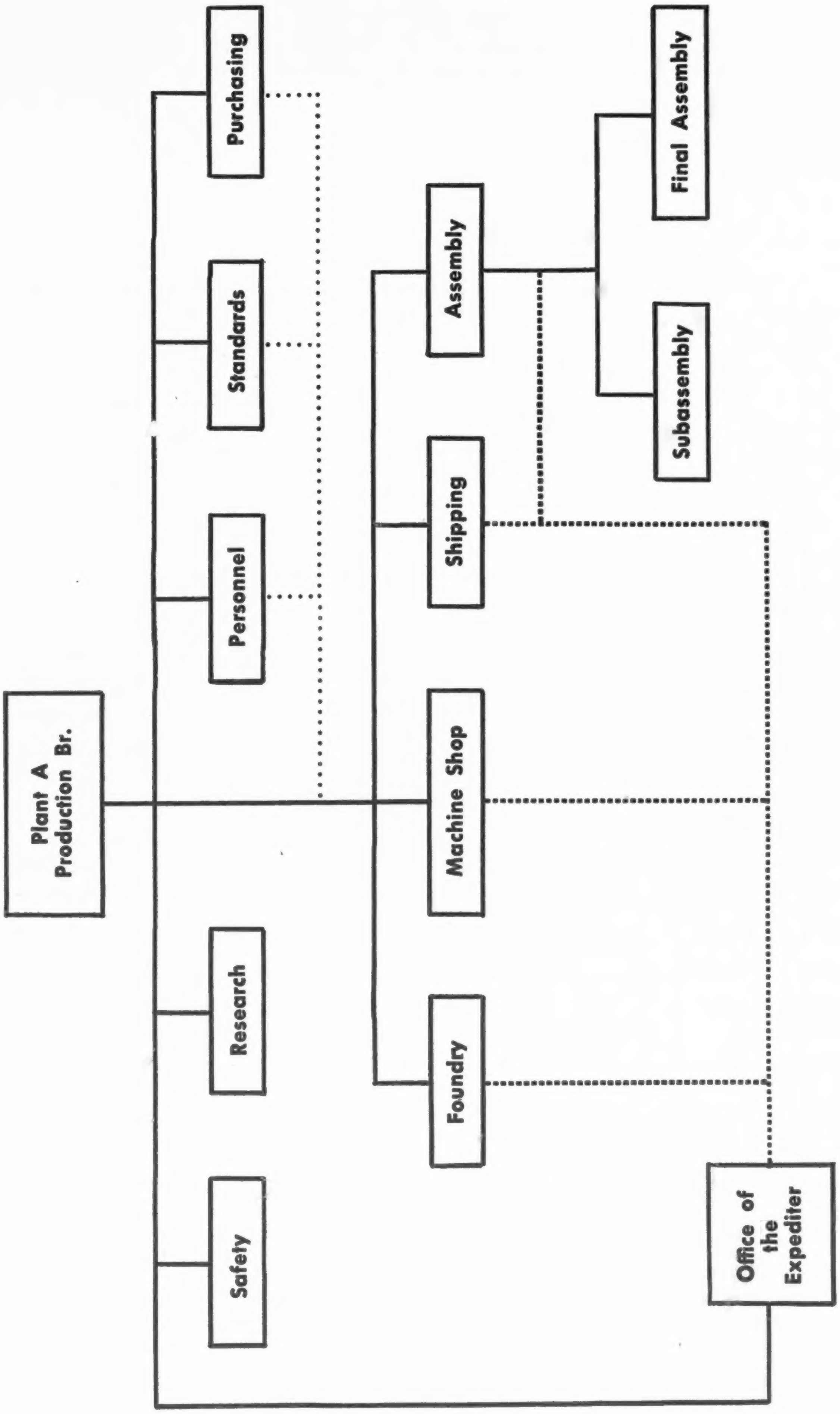

Foreman
Shop Clerk
Tool Clerk
Sheet Metal Foreman
Fabricating Foreman
Lead Man
Lead Man
Sheet Metal Worker
Assembler

While this organization is sufficient to care for the productive work of the organization, the product is subject to inspection by personnel who are members of the Standards Department. The Inspector exercises control over a single function of the department and, while not under the authority of the Foreman, is required to cooperate with him in order to maintain required standards and maximum production.

Thus, the Inspector exercises a functional responsibility over the workmen and maintains a cooperating liaison with the Foreman while being supervised from another department. This relationship would appear on the chart.


To Standards Department
Foreman
Inspector
Shop Clerk
Tool Clerk
Sheet Metal Foreman
Fabricating Foreman
Lead Man
Lead Man
Sheet Metal Worker
Assembler
Line Authority
Cooperation
Functional Authority

The finished chart illustrates an industrial organization that combines features of the line-staff and the functional types of organization. The chart also illustrates three types of relationship: direct, indirect, and functional. The chart could be expanded to illustrate other relationshipss, such as promotional lines and salary rates, but from the standpoint of the narrative report, such work would not be necessary. The same principles apply to the larger organizational chart which follows.


Plant A Production Br.
Safety
Research
Personnel
Standards
Purchasing
Foundry
Machine Shop
Shipping
Assembly
Subassembly
Final Assembly
Office of the Expediter

Note that, in this organization, the two staff departments, Safety and Research, have no direct connection with the operating units. On the other hand, Personnel, Standards, and Purchasing are functionally connected to the operating units. The sixth staff section, Expeditor, as given here, has a cooperating or liaison function.

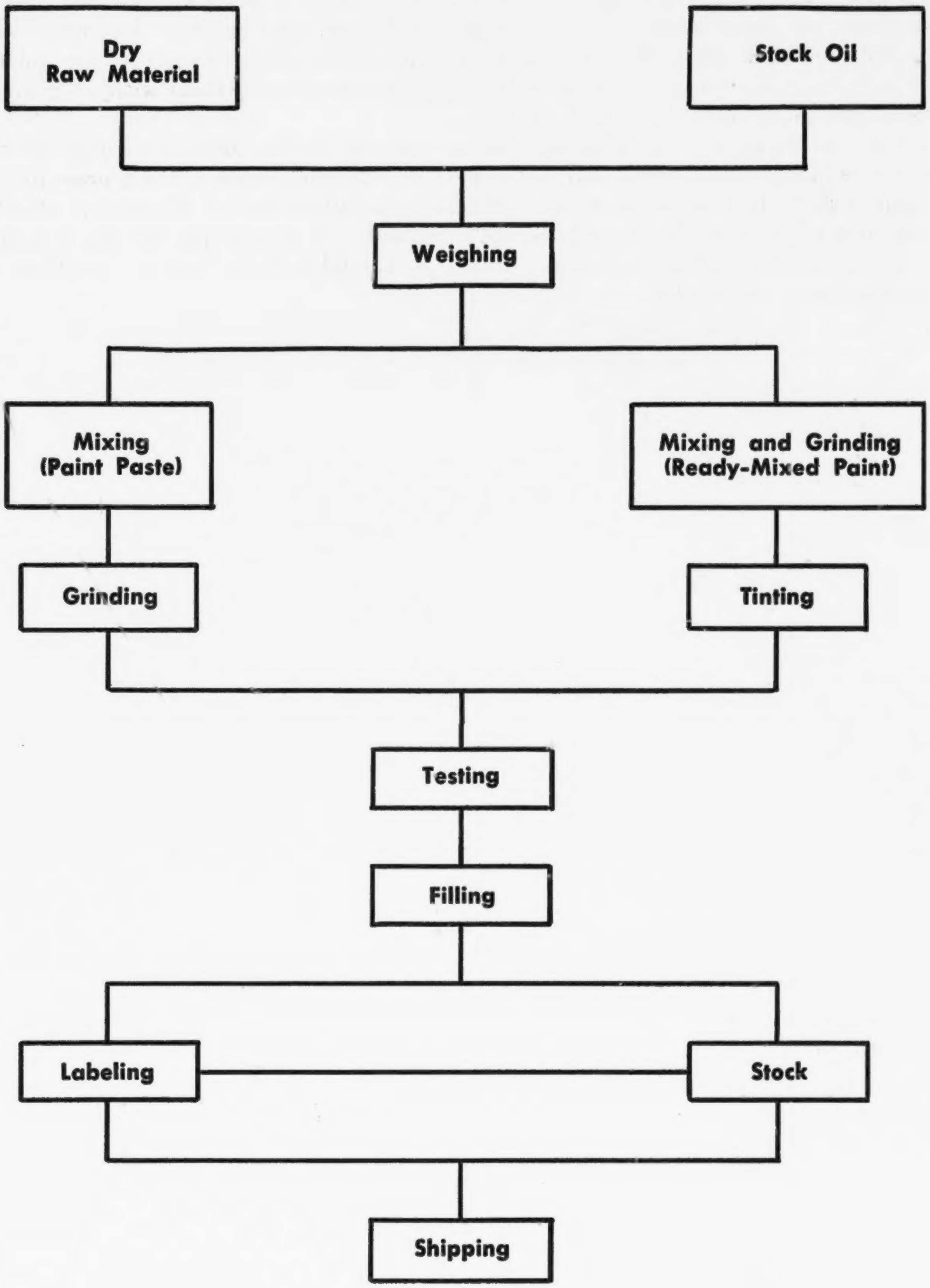
Process Charts

Process charts that graphically depict the workflow of a plant are no more difficult to prepare than are organization charts, provided they are kept simple. In many cases the analyst will find such charts in technical books and similar publications. Where such charts already exist, the analyst can make a bibliographical reference to them without going to the trouble of preparing his own.

When the analyst has found no such chart, however, he can prepare a simple chart in the same way he has prepared organization charts by substituting steps in the process for units in the organization. In process charts that illustrate the subnarratives, these steps should be in terms of jobs to relate them properly to the schedules. A sample process chart is included here. If the analyst wishes to examine others, he should refer to industry publications and various engineers' handbooks.

2

PROCESS FLOW CHART
Paint Paste, Ready-Mixed Paints


Dry Raw Material
Stock Oil
Weighing
Mixing (Paint Paste)
Mixing and Grinding (Ready-Mixed Paint)
Grinding
Tinting
Testing
Filling
Labeling
Stock
Shipping

VII

VERIFICATION OF JOB ANALYSIS

The plan of obtaining occupational information by verification, rather than by completely new analysis, occasionally is used to increase the amount of coverage that can be secured by a given amount of actual field work. Where applicable, verifications will avoid duplication of effort and, on occasion, will highlight slight job differences occurring in similar jobs.

Under this plan, a complete base or original analysis of a job is prepared, and this analysis is used as a basis for comparison with other similar jobs for which only partial, or verification, analyses are developed. The verification analysis is an incomplete analysis by itself, inasmuch as it depends upon the original analysis for basic information. This procedure proves useful in cases where significant job differences need be noted, where the store of job information already possessed must be augmented to secure a more accurate picture, and in cases where more detailed information is needed for a particular phase of occupational analysis work.

In preparing verification analyses, the analyst must remember that he is required to analyze the jobs as completely as before. The only difference is that the work of preparing his report has been shortened and facilitated by the original analysis he is verifying. The method of preparing verification analyses follows:

The analyst will fill in the identification data of the schedule in the customary manner. In addition he will place the letter "V" before the schedule number of the analysis. Also, in the "Work Performed" section, he will place the following notation:

"Verification of title and schedule number of job analysis schedule verified."

He will then fill out the job analysis form, except that in each section he will note in detail only variations from the original. If there is no variation from the original in a given section, the analyst will write the word "same." If the variation is slight, a clearer picture will be obtained if the analyst will introduce his explanation with "Same except . . ." or "Same and in addition . . ." and will describe the variation.

The relationships that will exist between the base analysis and the job with which it is being verified may take any one or more of several forms, among which are:

1. Some of the jobs will be identical in all respects. That fact should be noted and no verification analysis prepared.

2. Some jobs will be substantially alike, but variations will exist in the duties performed, methods employed, qualifications necessary for successful performance, equipment used, and conditions of employment.

(*a*) Where the worker performs more duties than are described in the base analysis, they should be noted and described, but if the addition of duties amounts to the combination of two or more jobs, as described in the base analysis, it is only necessary to note that fact.

(*b*) Where the worker does not perform some of the duties described, they should be noted, and it should be stated who does perform them. (If this separation amounts to the splitting of the duties into two jobs for which the qualifications are different, new job analysis schedules should be prepared for the two jobs.)

(*c*) Where a worker performs parts of several jobs as described in the separate original analysis, appropriate notes should be made on each of the original analyses, and a new job analysis schedule should be prepared for the job which otherwise would not be verified.

(*d*) Where methods, qualifications, or other factors of the job differ, the variations should be pointed out and any necessary descriptions should be given, but it is not necessary to repeat any description included in the original analysis.

VIII

THE JOB SPECIFICATION

One of the important personnel uses of job analysis information is for the preparation of job specifications. For this reason, a discussion of job specifications is included in this manual.

A job specification is the organized and written record of all the requirements sought in the individual worker for a specific job. As such, it differs from a job analysis schedule in important respects. The job analysis schedule is a report of pertinent facts obtained by a study of a job and, hence, is source material for any of a variety of personnel activities. A job specification is a job analysis product designed for a specific personnel activity—that of selection—and includes both job factors and other factors which may not be part of the job but which must be considered in the selection of an individual for a specific job. Not all the detailed information contained in a complete job analysis schedule may be required for this purpose and, therefore, need not appear in the specification. On the other hand, hiring factors which may be based on considerations entirely apart from the job itself are included in the job specification though they do not appear in the job analysis schedule.

Since the nature of the job determines a large share of the requirements needed for selection, a job analysis study affords an excellent opportunity for securing the information required on a realistic, factual basis, and sound grounding in job analysis techniques and concepts can be of much assistance to the specification writer. But, for the writer to prepare specifications of value, he should know also the nature of the complete information required and the use to which the information is put in the personnel process. Those selection requirements which are based on the job have been discussed in detail in the parts of this manual devoted to the job analysis schedule. They are the Work Performed, the Performance Requirements, the Sources of Workers, the equipment used, and the materials worked on or with. Of these, the performance requirements provide the largest single source of information concerning the factors of the job relating to worker requirements. Other requirements which are not based on the job and, therefore, have not appeared previously in the manual must not be ignored for that reason.

These other requirements may be based on a wide variety of considerations. They may be based on traditional hiring policies of the firm, such as unwillingness to accept employees who live outside the community or a preference for married workers. They may be based on legal requirements, such as licensing regulations for stationary engineers or health certification for food handlers. They also may be based on considerations which govern the willingness of the applicant to accept the job; for example, on the attractiveness of the job from the standpoint of wages, working conditions, and the prospect for advancement.

All of these factors are based on considerations which are beyond the control of the job itself. They may be based on plant custom, on community attitudes, on the competitive position of the company, on the status of the labor supply and demand, or on conditions affecting the stability of the plant working forces.

Completing the Job Specification Form

When prepared as a tool for use in local offices of the U.S. Employment Service and affiliated State employment services, job specifications are recorded on standard Job Specification

Forms. A sample completed Job Specification Form is included in appendix V. Entries on the Job Specification Form should be made in accordance with the instructions that follow. Requirements that are unrelated to job performance but are included because of company policy should be identified after the entry by a phrase such as "employer requirement" or "employer policy."

Employer's Name: Enter the official title of the establishment.

Address: Enter the address where the job is performed.

Telephone: Enter the telephone and extension number to be used for further contacts regarding the job.

Person To See, How To Reach: Enter last name and initials of person to whom applicants are sent for the employment interview. Indicate address where applicants are interviewed if different from principal address of establishment. Give instructions for reaching location by public transportation.

Industry: Record the name of the specific industry or branch of the industry represented by the establishment. Indicate the goods or services produced.

Code: Enter the industry code currently assigned to the establishment in local office employer records. If no code has been assigned, locate and assign an appropriate four-digit code from the Standard Industrial Classification Manual.

Occupational Title: Enter in all capitals the title under which the job is specifically defined in the *Dictionary of Occupational Titles*. If there is no suitable definition, use the employer's job title until a specific title and code number can be obtained from the U.S. Employment Service.

Code: Record the code number corresponding to the occupational title. If there is no definition in the *Dictionary of Occupational Titles*, select a temporary code for use pending receipt of a permanent code.

Employer's Job Title—Department: Record the title by which the job is known in the establishment and the department in which the job is located. Designate the department by title or number according to the practice of the employer.

Code: Enter the code number or symbol by which the job is designated by the employer. If none is used, enter a dash through the space.

Hours of Work: Enter the number of regular hours worked daily and weekly and other pertinent information, such as amount of overtime, number and times of shifts, shifts to which new employees are assigned, and rotation of shifts within the establishment.

Union: Enter the name of the union, the affiliation, and the number of the local. Indicate whether membership is optional or a condition of continued employment, and if the latter, indicate such information as how soon a worker must join and the amount of the initiation fee.

Rate of Pay: Record entry rate of pay and other details, such as incentive, premium, or bonus payments, and overtime rate. Record other applicable information, such as paid holidays, vacations, and periodic increases in the space entitled "Miscellaneous Comments," and indicate with an asterisk in "Rate-of-Pay" space that additional information is contained in the other section.

Sex: Enter the sex of the workers considered suitable for employment on the job, "M" for male, "F" for female, and a dash where either is suitable. If the employer specifies one sex for a job where either sex would be suitable, enter the employer's specifications with an appropriate explanation.

Age: If the job is considered suitable for only persons in a certain age range, enter the lowest and highest acceptable ages. If age is not a factor, enter a dash. If the employer has set age requirements not related to the requirements of the job, enter the employer's specifications with appropriate explanation.

Summary of Job: Enter a brief statement that summarizes the work done and serves to orient the placement officer to the job, much as Work Performed does in the job analysis schedule. Include the purpose of the job and the method by which it is accomplished. The summary should, in general, answer the "What," "Why," and "How" of the job analysis. When significant to the performance of the job, describe equipment used in terms of size, model, make, or capacity; the object worked on; the material used; and the speed and accuracy required to perform the job. When the workers hired for the job are definitely expected to progress to other jobs, reference should be made to the jobs to and through which workers are expected to progress.

Skills, Knowledge, Abilities: Record the minimum qualifications of the worker, except for physical capacity, that are essential to perform the job. These performance requirements should be expressed in terms of skills, knowledge, and abilities. Each entry should start on a new line and should be in decreasing importance to the satisfactory performance of the job. In order to save space, wherever possible each entry should start with a verb which would complete a sentence beginning "Worker must be able to . . . ." When appicable, performance requirements should include manual or manipulative skills; knowledge required concerning equipment, materials, work methods, procedures, and techniques; and mental activity, such as concentration, initiative, adaptability, judgment, and alertness.

Experience: The minimum work experience required as evidence of the worker's ability to perform the job should be recorded in terms of types of experience or specific tasks and the duration and recency. If the employer specifies work experience in excess of minimum requirements, an appropriate explanation should be made.

Education and Training: Enter the minimum education and training required to prepare a worker for the performance of the job, specifying the kind of training, the duration, and the recency of training. Include details of apprenticeship pertinent formal education (including vocational and technical training), and literacy requirements. If training is considered as an alternative to work experience as evidence of the worker's ability to do the job, this entry should be preceded by the word "Or". If the specified education or training is inconsistent with the requirements of the job, an appropriate explanation should be recorded.

Date: Enter the date on which the Job Specification Form was verified by the employer.

Prepared By: Enter name of person who prepared the job specification.

Approved By: This space is for the name of employer or company official who approved the job specification.

Physical Activities: Each item of physical activity required by the job should be indicated by an "X". The blank spaces are for any additional pertinent physical activities not included in the list.

Working Conditions: Each item of working conditions inherent in the job or characteristic of the plant or working situation should be designated by an "X". Blank spaces are for any additional working conditions not listed.

Details of Physical Activities: Detailed descriptions of all checked physical activities should be recorded in order of decreasing importance to the satisfactory performance of the job. Related items performed in sequence or simultaneously should be grouped for the description which should be in terms of duration and frequency and of intensity. Each description should begin with the verb or verbs corresponding to the activities on the checklist.

Details of Working Conditions and Hazards: Describe all checked items of working conditions in terms of duration and frequency and of intensity. Related items should be grouped when possible. Hazards from the working conditions should be described in a separate paragraph, each entry beginning with "Possibility of" and describing specific injuries which may result. If the hazard is reduced by safety devices or preventive measures, the extent of the reduction should be described. Variations in the hazards on different shifts should be described.

Miscellaneous Comments: This space is provided for pertinent information, such as physical examination requirements; licenses or certificates required; transportation, tools, equipment, or clothing which worker must furnish; citizenship requirements; and employee services unique to the job but not common to all other jobs in the establishment. This space should be used also for other items of interest to applicants, such as company policy on vacations, employee benefits, and pay periods. It also should be used for information for which there is insufficient space in the pertinent blocks.

Reference Materials: Occupational analysis publications other than the *Dictionary of Occupational Titles* that provide information about the job should be listed by specific titles and page numbers. Abbreviations such as "IA" for Interviewing Aids and "JD" for Job Descriptions may be used.

Other Sources of Workers: List occupations acceptable as sources of workers when workers with the specific occupational classification are not available. When possible, use titles from the *Dictionary of Occupational Titles.*

Tests: Any standardized tests used in selection of workers should be listed. Employment service tests should be listed by battery number when applicable. Speed and accuracy required for typing and shorthand tests should be indicated.

IX

STAFFING SCHEDULE AND JOB ANALYSIS PLANNING REPORT

The Staffing Schedule is a systematic but flexible plan for inventorying and recording information about jobs and workers in a plant. A Staffing Schedule presents the distribution of plant jobs as they occur in plant processes and gives a complete record of the manner in which workers are distributed among the jobs. Each schedule basically reflects the character of all jobs in a plant, not only as they relate to the operating processes but also as they relate to administration and facilitating services.

A Staffing Schedule, when made in conjunction with a complete plant job analysis study, serves initially as a preliminary Job Analysis Planning Report. As such, it defines the plant organization and shows the jobs that require study after all possible Dictionary conversions have been made. When the job analysis study is completed, the report in final form becomes a Staffing Schedule which shows, in addition to the character and distribution of jobs and workers, the analyst's treatment of all jobs in the plant. The combined Staffing Schedule and the Job Analysis Planning Report form serves for these situations.

The Job Analysis Planning Report should be prepared immediately after plant entrance to show the treatment planned for each job in the plant. The report, which should be labeled "Preliminary," should be submitted immediately to the analyst's supervisors (or headquarters) for review of and comments concerning the proposed treatment. In submitting a preliminary planning report for review and approval, certain data may be ommitted if obtaining such data would delay the preparation of the report. The final report (Staffing Schedule) should be complete unless the data are unobtainable.

Completing the Staffing Schedule and the Job Analysis Planning Report Form

The Staffing Schedule and the Job Analysis Planning Report consist of two forms, a face sheet and a title sheet, for recording job information and the general information required to identify the establishment in which the study was made. The face sheet provides for identification data, such as establishment number, classification of establishment by industry, products manufactured or services rendered, and the names of analysts conducting the study. The title sheet provides for a listing of jobs according to plant terminology and for conversion of this terminology to that of the *Dictionary of Occupational Titles*. In addition, this form provides space for recording the number employed on each job and any comments pertinent to the study. The forms should report all plant jobs, including administrative, supervisory, technical, and clerical jobs as well as jobs found in process operations.

Face Sheet

All sections of the face sheet should be completed in the same manner for use both as Job Analysis Planning Report and for Staffing Schedule. (See app. VI for an example of a completed face sheet.)

Number of Employees: Enter the total number of workers employed by the plant at the time of the study regardless of whether or not all jobs are listed.

775-181 O—65——6

Establishment Number: Enter the establishment number used to identify the study. This number should be identical to the number used to identify the job analysis schedules prepared in the plant. If no job analysis schedules are to be prepared, the establishment number should be assigned in the same manner as described on page 10.

Industry (*Dictionary of Occupational Titles*) Name: Enter the industry title as it appears in the *Dictionary of Occupational Titles*. If the industry is not represented in the Dictionary, enter the title and code number by which the industry is designated in the Standard Industrial Classification Manual. If the industry normally is divided into branches, enter the branch in which the establishment under study falls.

Products Manufactured or Services Rendered: Record information concerning the type, size, and other distinguishing characteristics of the output of the plant in order to identify the output and to distinguish it from similar or related products or services. If the number of products is too great to list in the space provided, products may be indicated by size range or other groupings, such as "Electric Motors—1¼ horsepower to 16 horsepower." Also note the materials and the facilities which the plant utilizes.

Remarks: Explain any circumstances or special factors concerning the operation of the plant which aid in providing an unbiased or undistorted picture of the numbers and kinds of workers employed. Such matters may be lack of materials, experimental nature of product, current changes in methods or products, or inability to achieve mass production. Such factors, if found, should be presented in the light of their effect on the labor picture.

Number of Title Sheets Attached: Enter the total number of title sheets which compose the study. The title sheets, numbered consecutively, should be attached to the face sheet to form the complete Staffing Schedule and Job Analysis Planning Report.

Signature: Record the name or names of the analyst or analysts preparing the study. If more than one analyst is listed, the supervisor of the study should be indicated.

Date: Following the signature, record the date on which the study was completed.

The code symbols which appear at the foot of the face sheet apply to items to be recorded on the title sheet. Explanations of the symbols will be found in the instructions for completing the title sheet.

Title Sheet

The title sheet is completed in a slightly different manner when used as a Staffing Schedule than when used as a Job Analysis Planning Report, However, several sections are completed in the same manner for both purposes. Unless specified, the instructions apply for completing both the Job Analysis Planning Report and the Staffing Schedule. See appendix VI for an example of a completed title sheet.

Title Sheet No. (Number): Number the title sheets consecutively starting with number 1. The numerical designation of each sheet should be combined with the total number of sheets in the form of a fraction, such as: $^{1}/_{18}$; $^{2}/_{18}$; $^{3}/_{18}$. . . .

Department: Enter the name of the department as it is designated in the plant. Ordinarily each departmental listing should be started on a new title sheet. If listings are short, two or more departments may be recorded on one title sheet to conserve space. When this is done, at least two lines should be left blank between departmental listings.

Number of Employees in Department: Enter the total number of employees in the department at the time the study was made.

No.: Number consecutively each line on which a new job entry is made, beginning with numerical 1 for the first entry in each departmental job listing. For example, if there are 15 jobs in the first department listed, the numbers should extend from 1 to 15; and if there are 8 jobs in the next department listed, the numbers should run from 1 to 8, regardless of the number of lines utilized for each entry.

Plant Title and Code: Record, in initial capitals, the job titles and codes (if any) used by the plant. If the plant uses more than one title for the job, enter the most commonly used or most descriptive title as the main title and indent the additional or alternate titles immediately under the title selected as the main title. Odd or unusual alternate titles should be explained in the "Comments" column. Plant codes may be omitted from the Job Analysis Planning Report.

Inex.: When preparing a Staffing Schedule, enter the symbol "X" (see bottom of face sheet) if no experience is required prior to placement on the job. The space should be left blank if the job is one for which experience is a prerequisite. Since these entries are made on the basis of the analyses, the space should be left blank on the Job Analysis Planning Report.

No. Employed: Record in column headed "M" the number of male workers on the job, in the column headed "F" the number of female workers, and in the column headed "T" the total workers employed on the job. If the establishment is working more than one shift daily, the number employed on each shift should be entered separately, one below the other, opposite the job title. This section need not be completed for the Job Analysis Planning Report.

Dictionary Title and Code: If the job corresponds to a job definition in the *Dictionary of Occupational Titles*, enter the DOT title (in all capitals) and code. Leave the space blank if no corresponding job can be found in the Dictionary.

Accurate conversion to Dictionary titles is important. This is especially true for jobs for which no job analysis schedules are prepared. Before making the conversion, the analyst must have an accurate conception of the job. This should be obtained by discussion with the department foreman and by observing the workers on the job. Conversions should not be forced. It should be remembered, however, that since Dictionary definitions present jobs as they exist typically in any plant, they rarely will be identical to the jobs in a specific plant. If there are significant differences in the basic core of the duties between plant jobs and the Dictionary definitions, conversion should not be attempted. On the other hand, differences in minor tasks should not obscure the fact that the jobs are essentially the same.

It should be noted that there may be differences between the conversions made for jobs on the Job Analysis Planning Report and the conversions for the same jobs as they appear on the Staffing Schedule. The final conversions will have been made after thorough job analyses that may reveal factors not evident in preliminary investigations or brought out during the preliminary plant tour.

The analyst frequently will find that two or more Dictionary definitions are required to reflect the duties of a specific job, or that a Dictionary definition reflects the duties of two or more jobs in the plant. When a plant job converts to two or more Dictionary definitions, the Dictionary titles and codes should be recorded within brackets opposite the plant title. When a Dictionary definition comprises two or more plant jobs, the jobs should be grouped in the listing and bracketed with the Dictionary title and code opposite the bracket. Various types of differences may be encountered when comparing plant jobs with the Dictionary. The most common of these are differences in title, in industrial designation, in occupational grouping, and in machines, tools, equipment, or materials. The analyst should decide in each case whether the differences between plant job and definition are significant and whether conversions should be made.

Tr.: The same symbols and same meanings apply whether the form is used as a Staffing Schedule or a Job Analysis Planning Report. However, in the Job Analysis Planning Report the symbols indicate the treatment proposed for each job, and in the Staffing Schedule the symbols indicate the treatment accorded each job. Just as there may be differences between conversions to Dictionary title and code on the Planning Report and on the Staffing Schedule, there may be differences between the treatment proposed and that accorded the job.

The symbol "O" should be used to designate jobs which have been converted to definitions in the *Dictionary of Occupational Titles* and for which it was not considered necessary to write schedules.

The symbol "V" should be used to indicate the preparation of a Verification Job Analysis Schedule. Since a Verification Job Analysis Schedule is used to verify another complete Job Analysis Schedule, infrequent use of this symbol is anticipated.

The symbol "A" should be used to indicate the preparation of a complete Job Analysis Schelule.

Comments: For Staffing Schedules, enter in all capitals the title of the job analysis schedule that was prepared for any of the jobs listed. The column may be used also for any brief explanatory remarks. To conserve space, any agreed-upon symbols or abbreviations such as the following may be used in making the notations:

GATB: General Aptitude Test Battery.
JAS: Job Analysis Schedule.
JD: Job Description.
JS: Job Specification.
OTQ: Oral Trade Tests (Questions).
PT: Performance Test.

In completing the Job Analysis Planning Report, this column should be used for any remarks which may be helpful in identifying the job in the plant or which may serve as reminders to the analysts in the subsequent analyses of the jobs.

APPENDIX I

Examples of Completed Job Analysis Schedules

The following completed job analysis schedule forms are included to show what completed schedules look like, and to indicate a few of the many ways in which job information may be presented, as well as to show how individual jobs require emphasis on different phases of the desired job information.

THESE SCHEDULES ARE TO BE CONSIDERED AS EXAMPLES—NOT MODELS.

Form USES-546
(2-44)

U. S. DEPARTMENT OF LABOR
BUREAU OF EMPLOYMENT SECURITY
UNITED STATES EMPLOYMENT SERVICE

Budget Bureau No. 44-R1098.1

JOB ANALYSIS SCHEDULE

1. Job title BASKET LIDDER
2. Number 9903111
3. Number employed M 2 F 0
4. Establishment No. 99-71-103
5. Date July 21, 1964
Number of sheets 3
6. Alternate titles fastener
basket fastener
box fastener
7. Dictionary title and code HEADER (agric.; whole tr.) 9-68.35
8. Industry Wholesale Citrus Fruit Distribution
9. Branch Packing House
10. Department Packing

11. **WORK PERFORMED:**

Places lids on baskets packed with citrus fruit and fastens them with wire, using a Gerrard Strapper, or with steel ribbon bands, using a stapling machine.

1. Prepares basket for fastening: Stands beside Box Stand at end of conveyor and pulls packed baskets from conveyor onto stand. Places Liner inside of lid and attaches lid to top of basket by slipping the tongues on each side of lid through wire handles of basket. (2-25%)

2. Fastens lids to baskets: Draws end of wire from Gerrard Strapper and wraps it around basket and through basket handles. Inserts wire end into strapper and presses lever to cut wire and twist the ends together. Nails down lids of packed crates of fruit, using hammer and nails. (3-30%)

3. Fastens fancy baskets: Places lids on fancy woven baskets and places them into ventilated cardboard box. Closes box by turning down flaps at creases and seals flaps with gummed tape. Wraps steel ribbon around box and fastens ends together with stapling machine to secure carton. (3-40%)

4. Places basket or box on conveyor: Attaches customer order to basket or box and lifts it onto conveyor for removal to labeling and shipping processes. (1-5%)

(CONTINUE ON SUPPLEMENTARY SHEETS)

Analyst I. M. Wrighten
Reviewer Martin Knetts

SOURCES OF WORKERS

12. Experience: None X Acceptable

13. Training data: Minimum training time—(a) Inexperienced workers. 1 week or less
(b) Experienced workers. 1/2 day

TRAINING	SPECIFIC JOB SKILLS ACQUIRED THROUGH TRAINING
In-plant (on job) training On-the-job training where knowledge of job may be gained through practical experience.	Learns to fasten baskets, and wrap wire around them to avoid damage to fruit. Learns to assemble cardboard boxes, to place in them the fancy baskets of fruits, to fasten
Vocational training None	boxes with gummed tape, and to wrap them with steel ribbon band to keep boxes secure. Learns to work at constant rapid rate of speed.
Technical training None	
SRW Eng. **General education** Enough education to understand and implement oral instructions.	
Activities and hobbies None	

14. Apprenticeship: Formal Informal Length required
15. Relation to other jobs:
(a) Promotions from and to, transfers, etc.: No promotional possibilities
(b) Supervision received: General X Close By PACKING HOUSE FOREMAN (Title)
(c) Supervision given: None X Number supervised Titles

The following items must be covered on supplementary sheets.

PERFORMANCE REQUIREMENTS

16. Responsibility (consider material or product, safety of others, equipment or process, cooperation with others, instruction of others, public contacts, and the like).
17. Job knowledge (consider pre-employment and on-the-job knowledge of equipment, materials, working procedures, techniques, and processes).
18. Mental application (consider initiative, adaptability, independent judgment, and mental alertness).
19. Dexterity and accuracy (consider speed and degree of precision, dexterity, accuracy, coordination, expertness, care, and deftness of manipulation, operation, or processing of materials, tools, instruments, or gages used).

COMMENTS

20. Equipment, materials, and supplies.
21. Definition of terms.
22. General comments.

PERFORMANCE REQUIREMENTS

16. Responsibility

Is responsible for attaching customers' orders to baskets so that orders may be properly billed and shipped. Is responsible for adhering to safety regulations of establishment.

17. Job Knowledge

Must know how to use a Gerrard Strapper and a stapling machine. Must know how to secure boxes and baskets so as to avoid damage to contents.

18. Mental Application

Worker must be able to work in noisy surroundings at rate of speed set by other workers on production line.

19. Dexterity and Accuracy

Eye-hand coordination and manual dexterity are required in using the Gerrard Strapper and the stapling machine. Boxes and baskets must be fastened securely to avoid damage to contents in shipping. Must attach correct order to each box or basket.

20. Equipment, Materials, and Supplies

Equipment:

Box Stand: A work platform separated from box conveyor by a few feet of space.
Gerrard Strapper: A trade name for a small hand machine especially made for the purpose of cutting and twisting the ends of wire when lever is pressed down by hand. Wire feeds through the machine.

Materials:

Mexican woven baskets (fancy woven), bushel and half-bushel baskets, and citrus fruit crates.

Supplies:

Liner: A colored (usually purple or green) cardboard circle cut to fit inside lid of basket. This liner helps to avoid damage to fruit and also contributes to an attractive appearance.

21. Definition of Terms

None.

22. General Comments

Male employees are used on this job because of the strenuous physical requirements of lifting boxes, baskets, and crates weighing up to 90 lbs.

Form USES-130

DEPARTMENT OF LABOR
BUREAU OF EMPLOYMENT SECURITY
UNITED STATES EMPLOYMENT SERVICE

Budget Bureau No. 44-R1161

PHYSICAL DEMANDS FORM

Job Title BASKET LIDDER

Occupational Code 9-68.35

PHYSICAL ACTIVITIES

1 X Walking
2 O Jumping
3 O Running
4 O Balancing
5 O Climbing
6 O Crawling
7 X Standing
8 X Turning
9 O Stooping
10 O Crouching
11 O Kneeling
12 O Sitting
13 X Reaching
14 X Lifting
15 X Carrying

16 O Throwing
17 O Pushing
18 X Pulling
19 X Handling
20 O Fingering
21 O Feeling
22 O Talking
23 O Hearing
24 X Seeing
25 O Color vision
26 O Depth perception
27 X Working speed
28
29
30

WORKING CONDITIONS

51 X Inside
52 O Outside
53 O Hot
54 O Cold
55 O Sudden temperature changes
56 O Humid
57 O Dry
58 O Wet
59 O Dusty
60 O Dirty
61 O Odors
62 X Noisy
63 X Adequate lighting
64 X Adequate ventilation
65 O Vibration

66 O Mechanical hazards
67 X Moving objects
68 O Cramped quarters
69 O High places
70 O Exposure to burns
71 O Electrical hazards
72 O Explosives
73 O Radiant energy
74 O Toxic conditions
75 O Working with others
76 X Working around others
77 O Working alone
78
79
80

DETAILS OF PHYSICAL ACTIVITIES:

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Stands (100%). Pulls and handles baskets on box stand (25%). Reaches for and carries baskets or crates weighing up to 90 lbs. for short distances (10%). Handles baskets, crates, boxes, Gerrard Strapper, stapling machine, wire, and steel ribbon (100%).

DETAILS OF WORKING CONDITIONS:

Works inside (100%). Adequate lighting and ventilation (100%). Boxes, crates, and baskets are moving along conveyor (80%).

DETAILS OF HAZARDS:

None.

Form USES-546
(2-44)

U. S. DEPARTMENT OF LABOR
BUREAU OF EMPLOYMENT SECURITY
UNITED STATES EMPLOYMENT SERVICE

Budget Bureau No. 44-R1098.1

JOB ANALYSIS SCHEDULE

1. Job title TOOL DESIGNER
2. Number 9901613
3. Number employed M 4 F 0
4. Establishment No. 99-95-40
6. Alternate titles junior tool designer
senior tool designer
5. Date March 10, 1964
Number of sheets 4
8. Industry Construction Machinery Mfg.
9. Branch Concrete Mixers, Conveyor Equip.
7. Dictionary title and code TOOL DESIGNER, 0-48.41
10. Department Tool Design

11. **WORK PERFORMED:**

Designs special tools, dies, jigs, and fixtures for use on all types of production machines to machine parts from raw material through finished stages.

1. Studies tooling problem to determine the basic part and machine specifications governing the design of the tool: (3-25%) (See Comments.)

   a. Reads Tool Order, examines blueprint of finished part, and analyzes Sequence of Operations Sheet to determine machining operations required of new tool.

   b. Studies part and part blank and computes the dimensions of part or parts before and after machine operation for which tool design is required. (See Comments). Sketches part in relationship to tool as guide to tool design.

   c. Examines machine for which tool is to be made and confers with shop foreman to gather information to make decisions relative to designing the tool needed to perform the necessary machining operations. Draws sketches of machine and part incorporating basic decisions made, including dimensions, clearances, and tolerances.

2. Designs the tool: (3-30%)

   a. Develops the form and shape of the tool by studying tool design drawing of other similar tools, by comparing own ideas of the tool's design with accumulated part and machine specifications, and by drawing rough and semidetailed sketches.

   b. Calculates final detail dimensions, clearances, and tolerances of tool, using Design Reference Book, machinists' handbook, mechanical engineers' handbook, trigonometry, slide ruler, and standard formulas.

   c. Draws general assembly drawings of complete tool showing top, front, and side views, tool, machine, and part in actual use, and all dimensions, tolerances, and clearances.

(CONTINUE ON SUPPLEMENTARY SHEETS)

Analyst N. Devers
Reviewer Miss T. Day

SOURCES OF WORKERS

12. Experience: None ________ Acceptable TOOL DESIGN DRAFTSMAN

13. Training data: Minimum training time—(a) Inexperienced workers.
(b) Experienced workers. 6 months

TRAINING	SPECIFIC JOB SKILLS ACQUIRED THROUGH TRAINING
In-plant (on job) training TOOL DESIGNER APPRENTICE	Fundamental principles of tool designing. Experience designing tools. Calculating dimensions and reading blueprints and specifications. Knowledge of algebra and other mathematics that are helpful in computations.
Vocational training Technical school or vocational school. Course must include algebra, geometry, trigonometry, mechanical drawing, machine shop practice, and shop mathematics.	
Technical training	
SRW Eng. General education	
Activities and hobbies Metal Working, Wood Working	Fundamentals of designing and knowledge of calculations.

14. Apprenticeship: Formal X Informal ________ Length required 5 yrs. DESIGN DRAFTSMAN

15. Relation to other jobs:

(a) Promotions from and to, transfers, etc.: From DETAILER or DESIGN DRAFTSMAN; promotion to LEADMAN (GROUP LEADER)

(b) Supervision received: General X Close ________ By CHIEF TOOL DESIGNER
(Title)

(c) Supervision given: None ________ Number supervised 3 Titles DESIGN DRAFTSMAN

The following items must be covered on supplementary sheets.

PERFORMANCE REQUIREMENTS

16. Responsibility (consider material or product, safety of others, equipment or process, cooperation with others, instruction of others, public contacts, and the like).

17. Job knowledge (consider pre-employment and on-the-job knowledge of equipment, materials, working procedures, techniques, and processes).

18. Mental application (consider initiative, adaptability, independent judgment, and mental alertness).

19. Dexterity and accuracy (consider speed and degree of precision, dexterity, accuracy, coordination, expertness, care, and deftness of manipulation, operation, or processing of materials, tools, instruments, or gages used).

COMMENTS

20. Equipment, materials, and supplies.
21. Definition of terms.
22. General comments.

3. Writes tool specifications covering materials and processes: (2-15%)

   a. Selects commercial tool items for purchase from vendors, considering part machined, tolerances, and allowances of tool and part, speed of machine, tool coolants used, estimated tool life, and cost in relation to specifications desired.

   b. Selects type of material, such as tool steel to use in fabricating tool, using same criteria in selecting material as purchased part.

   c. Determines fabrication or construction specifications.

4. Assigns general assembly drawings to DESIGN DRAFTSMAN for preparation of detail drawings of tool parts, advises draftsman concerning drafting techniques and procedures, and reviews completed detail drawings. (1-10%)

5. Advises TOOLMAKER on problems, such as sizes, tolerances, clearances, material selection, and other problems encountered in fabricating and assembling the tool. (1-10%)

6. Redesigns tools which fail to meet machining requirements. (2-10%)

PERFORMANCE REQUIREMENTS

16. Responsibility

Responsible for proper and efficient design to tools, drill jigs, turning fixtures, grinding fixtures for surface grinders, and cylindrical grinders, blanking, piercing, and forming dies and gages. Is responsible for the correct dimensions and calculation of tools, jigs, fixtures, dies, and gages. Is responsible for assigning assembly drawings to DESIGN DRAFTSMEN. Is responsible for verifying that completed drawings comply with specifications and blueprints.

17. Job Knowledge

Must have knowledge of shop mathematics and drafting techniques. Must be able to read and understand blueprints. Must be able to use micrometers, verniers, height and depth gages, and calipers. Must have knowledge of tool design, toolmaking methods, and machining and other properties of metals.

18. Mental Application

Must be able to develop new ideas in tool design and to adapt existing designs. Must be alert and able to concentrate on fine detail. Must be able to exercise independent judgment, and confer with others to resolve problems. Must exercise initiative in solving design problems.

19. Dexterity and Accuracy

Must be accurate in making calculations and in designing tools because the tools must meet very fine specifications, often to within .0001 of an inch. Must be able to read instructions, specifications, and various measuring instruments with absolute accuracy.

20. Equipment, Materials, and Supplies

Pencils, blueprints, books, drawing instruments, and specifications.

21. Definition of Terms

Design Reference Book. A company-prepared reference book used by the engineering department. It contains tables, graphs, charts, formulas, and text materials related to basic engineering data on tool design and production machines.

Sequence of Operation Sheet. A company form prepared by PRODUCTION ENGINEER outlining the steps in the manufacture of a part. Each step is described as to type of machine, type of machining operation, and dimensions of part after machining.

Tool Order. A company form prepared by PRODUCTION ENGINEER outlining all the tools needed to manufacture a part. A detailed engineering drawing of finished part and a sequence of operations sheet are part of the tool order.

22. General Comments

Item 11. In general, the TOOL DESIGNERS develop all types of tools for various production machines used in the factory. The TOOL DESIGNERS are not recognized as specialists in such areas as tool or cutter design, jig or fixture design, or die design. Some of the men have more talent, interest, and experience in some of these special areas, and the supervisor routes such jobs to them. At times two or more TOOL DESIGNERS will work on one tool order, each designing one particular tool of the many making up the tool order.

Item 13. Vocational school graduates and technical high school graduates who have training in algebra, geometry, trigonometry, mechanical drawing, machine shop practice, and shop mathematics can be trained on the job to become TOOL DESIGNERS so that MECHANICAL ENGINEERS can utilize the fuller scope of their training on machine design or in a supervisory or advisory capacity on design activities.

Form USES-130

DEPARTMENT OF LABOR
BUREAU OF EMPLOYMENT SECURITY
UNITED STATES EMPLOYMENT SERVICE

Budget Bureau No. 44-R1161

PHYSICAL DEMANDS FORM

Job Title TOOL DESIGNER

Occupational Code 0-48.41

PHYSICAL ACTIVITIES

1 X Walking
2 O Jumping
3 O Running
4 O Balancing
5 O Climbing
6 O Crawling
7 X Standing
8 O Turning
9 O Stooping
10 O Crouching
11 O Kneeling
12 X Sitting
13 O Reaching
14 .... Lifting
15 .... Carrying

16 O Throwing
17 O Pushing
18 O Pulling
19 X Handling
20 X Fingering
21 O Feeling
22 X Talking
23 X Hearing
24 X Seeing
25 O Color vision
26 O Depth perception
27 O Working speed
28 ....
29 ....
30 ....

WORKING CONDITIONS

51 X Inside
52 O Outside
53 O Hot
54 O Cold
55 O Sudden temperature changes
56 O Humid
57 O Dry
58 O Wet
59 O Dusty
60 O Dirty
61 O Odors
62 O Noisy
63 X Adequate lighting
64 X Adequate ventilation
65 O Vibration

66 O Mechanical hazards
67 O Moving objects
68 O Cramped quarters
69 O High places
70 O Exposure to burns
71 O Electrical hazards
72 O Explosives
73 O Radiant energy
74 O Toxic conditions
75 X Working with others
76 X Working around others
77 O Working alone
78 ....
79 ....
80 ....

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DETAILS OF PHYSICAL ACTIVITIES:

Sits (90%). Reaches for blueprints, specifications, and designing equipment. Reads blueprints and makes calculations. Stands and walks 10% to and from other personnel to assign work or to confer with them.

DETAILS OF WORKING CONDITIONS:

Inside (100%). Works in constant contact with others in adequately lighted and ventilated room.

DETAILS OF HAZARDS:

None.

Form USES-546
(2-44)

U. S. DEPARTMENT OF LABOR
BUREAU OF EMPLOYMENT SECURITY
UNITED STATES EMPLOYMENT SERVICE

Budget Bureau No. 44-R1098.1

JOB ANALYSIS SCHEDULE

1. Job title ENGINEERING WEIGHT COMPUTER A
2. Number 990
3. Number employed M 3 F 2
4. Establishment No. 99-7030-123
6. Alternate titles
5. Date February 24, 1963
Number of sheets 5
8. Industry Aircraft Manufacturing
9. Branch
7. Dictionary title and code WEIGHT ANALYST 0-68.58
10. Department Engineering

11. **WORK PERFORMED:**

Estimates weights and balances of aircraft and missile parts, subassemblies, and major assemblies for preliminary designing. Calculates weights and balances for critical and highly stressed structural assemblies and parts of aircraft and missiles, from specifications and blueprints, using slide rule and calculator.

1. Compiles weight data of complete aircraft and sections and prepares formal reports in accordance with contract requirements, Army and Navy weight breakdown standards, and engineering requirements (1-40%):

    a. Computes weights of parts from blueprint drawings and specifications, using standard formulas for determining weights of metals, planimeter for determining area of irregularly shaped parts, and calculating machine and slide rule.

    b. Records weights on Army and Navy "weight report card" and on "weight report form" by component, unit, and functional group.

    c. Compiles weight data for complete aircraft in "weight listing record," by part number and weight of part.

2. Prepares preliminary estimates of weights and balances for proposed major changes in aircraft structures such as complete wing, body section, or empennage. (2-20%):

    a. Computes weights and centers of gravity of components working from layout sketches of proposed changes, using standard formulas to compute weights, and trigonometry involving horizontal or vertical balance points or moment arms to figure center of gravity. Performs calculations with calculating machine or slide rule.

    b. Computes weight data of components for the complete change and computes total weight and center of gravity for each unit, using standard formulas, calculating machine, or slide rule.

(CONTINUE ON SUPPLEMENTARY SHEETS)

Analyst Anna Liszt
Reviewer O. Presser

SOURCES OF WORKERS

12. Experience: None .... Acceptable ENGINEERING WEIGHT COMPUTER B

13. Training data: Minimum training time—(a) Inexperienced workers.
(b) Experienced workers. (None see Comments)

TRAINING	SPECIFIC JOB SKILLS ACQUIRED THROUGH TRAINING
In-plant (on job) training 3 to 5 years as an ENGINEERING WEIGHT COMPUTER in a lower class.	Basic knowledge and experience of weight computing necessary to becoming an efficient weight analyst.
Vocational training None	None
Technical training 2 years college which includes mathematics and physics.	Practical working knowledge of mathematics and physics.
SRW Eng. General education High school graduate.	Basic skills necessary to further education at least through 2 years college communication skills.
Activities and hobbies None	None

14. Apprenticeship: Formal .... Informal .... Length required ....

15. Relation to other jobs:

(a) Promotions from and to, transfers, etc.: From ENGINEERING WEIGHT COMPUTER B (see Comments for promotion to:)

(b) Supervision received: General X Close .... By WEIGHT UNIT GROUP ENGINEER (Title)

(c) Supervision given: None X Number supervised .... Titles ....

The following items must be covered on supplementary sheets.

PERFORMANCE REQUIREMENTS

16. Responsibility (consider material or product, safety of others, equipment or process, cooperation with others, instruction of others, public contacts, and the like).

17. Job knowledge (consider pre-employment and on-the-job knowledge of equipment, materials, working procedures, techniques, and processes).

18. Mental application (consider initiative, adaptability, independent judgment, and mental alertness).

19. Dexterity and accuracy (consider speed and degree of precision, dexterity, accuracy, coordination, expertness, care, and deftness of manipulation, operation, or processing of materials, tools, instruments, or gages used).

COMMENTS

20. Equipment, materials, and supplies.
21. Definition of terms.
22. General comments.

c. Consults with WEIGHT CONTROLLER (ENGINEER) with reference to weight and balance of proposed changes to point out any discrepancies or problems that might arise because of proposed changes.

3. Calculates weight and balance of any system or major component of aircraft through layout stages, using standard formulas to calculate weights and trigonometry to figure balance. Compares calculated weight and balance with preliminary estimates to determine the difference between estimated and actual weights and balances. Uses calculator and/or slide rule to perform calculations. (3-5%)

4. Calculates weight data for weight and balance studies to ascertain that weights and balances are maintained within prescribed limits in aircraft under varying loading conditions. (2-15%)

   a. Gathers weight data for section or unit under study from "weight report forms," "weight listing records," or Army and Navy "weight report cards," and computes total weight and center of gravity, using trigonometry to compute center of gravity, and calculator and/or slide rule to compute total weight.

   b. Compiles loading charts for use in loading aircraft to maintain center of gravity within specified limits, using weight and center of gravity data computed for each article to be loaded into aircraft, and moment arm formulas to determine location for each article.

   c. Prepares center of gravity grid to show variations in center of gravity of aircraft with different loadings or distributions of weight.

   d. Confers with other units and groups, such as Flight Test Group, Stress Analysis Group, and Total Weight Group, to determine sequence of fuel usage from tanks during flight to maintain center of gravity within specified limits, using formulas to determine weight of fuel and trigonometry to determine variations in the center of gravity as the fuel is used.

5. Prepares "panel section" loadings for stress analysis group. (3-5%)

   a. Computes total weight of one complete section of aircraft, such as wing section or fuselage section, by totaling the weights of all component parts, and determines center of gravity using trigonometry.

   b. Records weight and center of gravity data on standard form and routes to stress group for stress analysis.

6. Leads, instructs, and works with personnel of lower job classification. (3-15%)

PERFORMANCE REQUIREMENTS

16. Responsibility

Is responsible for weight data, balance, center of gravity of aircraft and aircraft loads. Is responsible for the safety of aircraft with respect to its loading, fuel content, and fuel distribution. Is responsible for maintaining flight loading and balance charts. Is responsible for instructing personnel in lower-grade classification.

17. Job Knowledge

Must have good working knowledge of trigonometric formulas. Must be able to read and interpret specifications and blueprints. Must be able to record data accurately and use a calculating machine and slide rule. Must be able to compile weight data and make estimates of the weights of aircraft and assemblies, based upon blueprints and specifications.

18. Mental Application

Must be alert and make accurate calculations because decisions affect safety of aircraft and personnel. Must be able to use independent judgment to solve problems that arise in weight balancing or loading. Must be able to consult with other personnel that are concerned with weight and balance problems of aircraft.

19. Dexterity and Accuracy

Dexterity of fingers and hands is required for the operation of a calculating machine and a slide rule. Must be accurate when reading figures from slide rule and calculator and when transcribing data.

20. Equipment, Materials, and Supplies

Pencils, weight charts, paper, calculator, slide rule

21. Definitions of Terms

Empennage - aircraft tail

22. General Comments

Item 13b. Only experienced personnel are promoted to this job, and promotion is dependent upon good performance as an ENGINEERING WEIGHT COMPUTER B.

Item 15a. Promotion from this job to a higher job classification depends upon the increase in education. This organization has a program for assisting the employees in further training. A school is maintained by the company that offers subjects after working hours. Financial aid and working hour adjustments are offered to assist college graduates in postgraduate training.

Item 15c. Company management states that these employees do not supervise, they merely lead, work with and instruct employees of lower classification. They do assign and check the work of lower grade employees, but have no responsibility for cost, methods, or personnel.

Form USES-130

Budget Bureau No. 44-R1161

DEPARTMENT OF LABOR
BUREAU OF EMPLOYMENT SECURITY
UNITED STATES EMPLOYMENT SERVICE

PHYSICAL DEMANDS FORM

Job Title ENGINEERING WEIGHT COMPUTER A

Occupational Code 0-68.58

PHYSICAL ACTIVITIES

1 X Walking
2 0 Jumping
3 0 Running
4 0 Balancing
5 0 Climbing
6 0 Crawling
7 X Standing
8 0 Turning
9 0 Stooping
10 0 Crouching
11 0 Kneeling
12 X Sitting
13 X Reaching
14 0 Lifting
15 0 Carrying

16 0 Throwing
17 0 Pushing
18 0 Pulling
19 X Handling
20 X Fingering
21 0 Feeling
22 X Talking
23 X Hearing
24 X Seeing
25 0 Color vision
26 0 Depth perception
27 0 Working speed
28 0
29 0
30 0

WORKING CONDITIONS

51 X Inside
52 0 Outside
53 0 Hot
54 0 Cold
55 0 Sudden temperature changes
56 0 Humid
57 0 Dry
58 0 Wet
59 0 Dusty
60 0 Dirty
61 0 Odors
62 0 Noisy
63 X Adequate lighting
64 X Adequate ventilation
65 0 Vibration

66 0 Mechanical hazards
67 0 Moving objects
68 0 Cramped quarters
69 0 High places
70 0 Exposure to burns
71 0 Electrical hazards
72 0 Explosives
73 0 Radiant energy
74 0 Toxic conditions
75 X Working with others
76 X Working around others
77 0 Working alone
78 0
79 0
80 0

16—62316-1 U. S. GOVERNMENT PRINTING OFFICE

DETAILS OF PHYSICAL ACTIVITIES:

Sits (90%); reaches for and handles reference materials, pencils, slide rules and specifications (45%); operates calculating machines (30%); consults with, and instructs other personnel (15%). Near visual acuity is required for work with printed materials and in performing calculations. Stands (10%) walks to and from shops and test sites to gather data and consult with other personnel.

DETAILS OF WORKING CONDITIONS:

The work is performed indoors in a well-lighted and well ventilated office (100%); visits are made to other shops and work sites for consultations (10%); instructs other personnel (15%).

APPENDIX II

NARRATIVE REPORT

ESTABLISHMENT NO. 99-37-16

The Tri X Farmers Exchange is the egg-processing division of a large farm cooperative engaged in the purchase of eggs, poultry, and meats from contract farmers. These products are processed and sold to supermarkets within the local area. The farm cooperative also processes fertilizer and purchases farm supplies and equipment from manufacturers and resells them to farmers through retail stores that are located in the central part of the State. This study is limited to the processing of eggs, most of which are bought on a contract basis. Processing includes washing, grading, packing, and a limited amount of freezing. This establishment processes an average of 140,000 dozen eggs a week.

DESCRIPTION OF WORK PROCESS

Eggs are loaded on a conveyor belt from crates by a **LOADER** operating a lift with 30 pneumatic suction cups. The time required to lift 30 eggs and place them on conveyor belt by pneumatic lift is approximately the same time required to lift 10 eggs by hand and place them on the conveyor belt. Eggs loaded on the conveyor move through steam that is composed of water mixed with a detergent solution. Eggs then move through a hot air drying section. This process is unmanned.

After the eggs leave the air drying section, they continue by conveyor into the candling booth. The movement of the conveyor is so timed as to feed eggs to the candling booth at certain intervals. While eggs are over the light in the candling booth, they are lifted and twirled by machine. The **CANDLER** examines eggs without handling them. The **CANDLER** removes eggs that show defects and those grades of eggs for which machine is not set up. Eggs continue from the candling booths through automatic weighing machines and are diverted onto auxiliary conveyors according to weight. This section of the conveyor is unmanned.

Eggs move down the auxiliary conveyors and turn at a 90° angle to a deadend section long enough to hold 6 or 12 eggs. When the 6th or 12th egg moves to the end position, the egg trips a lever which activates a suction mechanism that picks up the eggs and places them in cartons or flats. This station is manned by an **EGG PACKING MACHINE TENDER** who feeds carton blanks into a carton-forming machine, and egg crate flats directly on the conveyor. The carton-forming machine is connected to the packing machine so that cartons are formed and moved under the suction device. The **EGG PACKING MACHINE TENDER** at this station observes closely for any malfunctioning of this operation.

After cartons or flats have been filled, they move on a conveyor through a food preservative spray and a sealing, closing, and labeling device. This operation is unmanned, except for a daily loading of labels and the setup of the machine. At the end of the conveyor, the eggs are taken off by a **CARTON PACKER** and a **CRATE PACKER**. No automation or mechanization is involved in off-bearing. Eggs are then picked up by **TIER-LIFT-TRUCK OPERATOR** and carried to the shipping and receiving department.

Some eggs are rejected because they are cracked or are of such varying size that the grading section of the candling booth is not set up to accommodate them. These eggs are candled by hand, along with the ungraded eggs from the shipping and receiving department. Some of these eggs are packed by hand. The cartons are formed by machine and the eggs enter the processing line at the preservative spray section and continue through the closing, sealing, dating, and off-bearing sections. Eggs are then picked by the TIER-LIFT-TRUCK OPERATOR and are carried to the shipping and receiving department. Those ungraded and cracked eggs that are further rejected go through the breakout room where they are broken and smelled. Bad eggs are discarded; good eggs are then sent to the freezing section. After they are frozen, they are carried to the shipping and receiving department and are stored.

PLANT ENVIRONMENTAL FACTORS

This establishment is clean, air conditioned, and well lighted. There is a small plant cafeteria that is operated during work hours for the convenience of the employees. There is very little noise in or around this establishment. Occasionally loud noises are experienced from the outside as trucks enter and leave the shipping platform; however, the sound produced within the plant from the conveyors and other machinery is never critical. An odor of the detergent that is used in the washing machine can be smelled in most parts of this plant but it is not noxious.

Serious injury in this plant is almost nonexistent. Minor injuries are infrequent. However, possibilities for injuries do exist for personnel working with, or within proximity of, tier-lift trucks, conveyors, and other movable machinery and/or equipment.

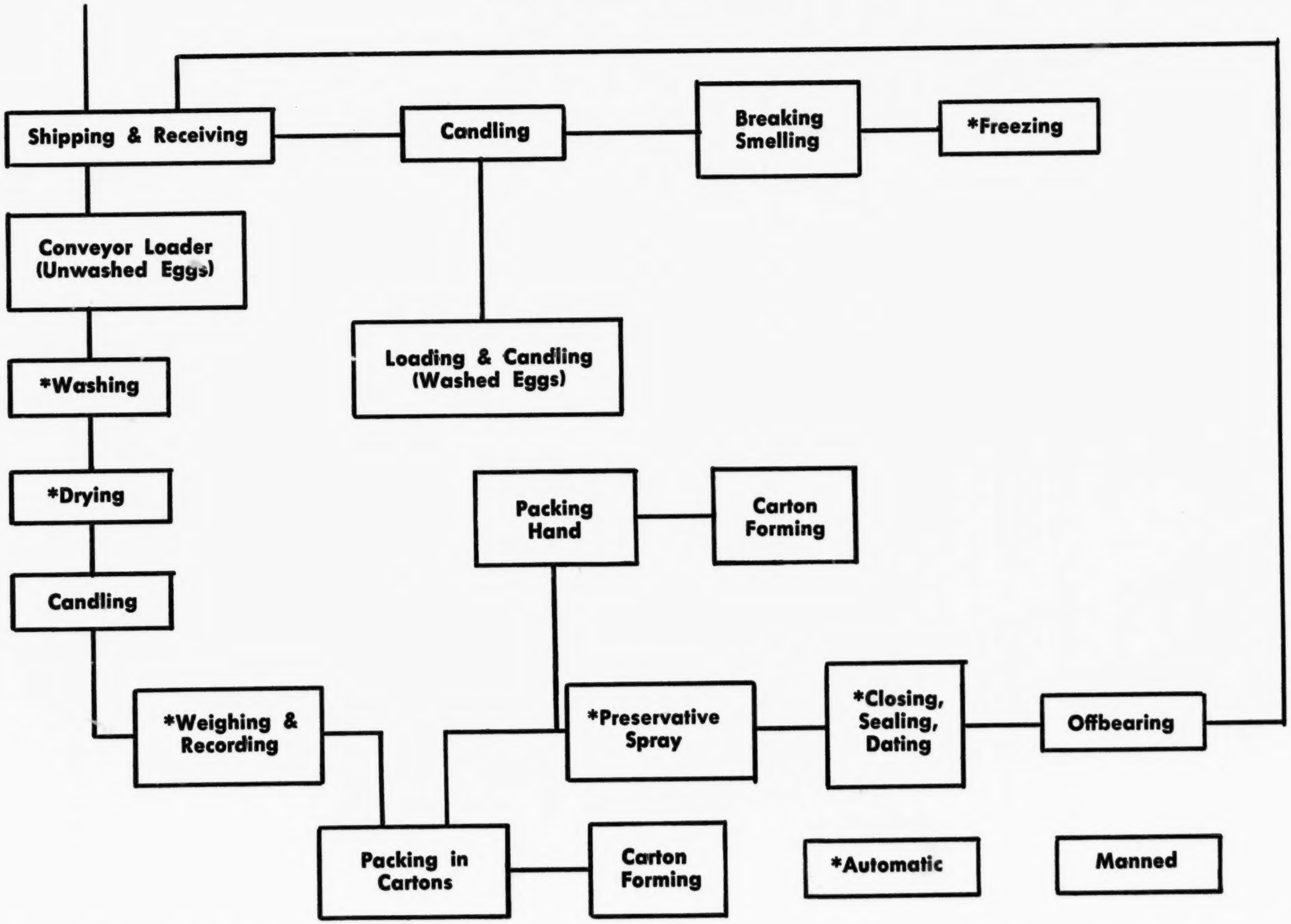
PLANT PLACEMENT POLICIES

The training for jobs in this plant is usually on the job. However, in one instance a foreman was sent to the plant of the manufacturer to study maintenance and repair of machinery that existed in this establishment. This establishment also hired a MACHINE-REPAIR FLOORMAN, and a manufacturer's representative came to the plant and assisted the foreman in training the new repairman. The training time extends from 3 days to 6 months, except for that of the EGG PROCESSING PLANT SUPERVISOR, which takes approximately 1 year because of the large variety of duties that he must perform. No specialized training is required for entry jobs, only a general education sufficient for communicating with coworkers and for learning the required tasks of the job. There are no definite lines of promotion within this plant, but workers are upgraded into jobs that require more experience and skill as vacancies arise.

This is an equal opportunity establishment. There are no restrictions on the employment, training, and promotion of persons of minority groups, women, or the handicapped. In all instances, employment is based upon possession of basic skills essential to adequate job performance.

This establishment is automated. Workers within the plant have been trained for new jobs resulting from automation, and additional workers have been hired as a result of the installation of automated equipment. This establishment now works in two shifts. Prior to automating, it operated on only one shift. Four new jobs have been created as a result of automation. They are: EGG PACKING MACHINE TENDER, CONVEYOR LOADER, CANDLER (conveyor system), and MACHINE REPAIR FLOORMAN.

PROCESS FLOW CHART
Egg Candling and Packing


Shipping & Receiving
Candling
Breaking Smelling
*Freezing
Conveyor Loader (Unwashed Eggs)
Loading & Candling (Washed Eggs)
*Washing
*Drying
Packing Hand
Carton Forming
Candling
*Weighing & Recording
*Preservative Spray
*Closing, Sealing, Dating
Offbearing
Packing in Cartons
Carton Forming
*Automatic
Manned

APPENDIX III

TYPICAL OVERALL SOUND LEVELS*

AT A GIVEN DISTANCE FROM NOISE SOURCE		*Decibels*	ENVIRONMENTAL
50-HP Siren	(100′)	140	
F-84 At Take-Off (80′ From Tail)			
Hydraulic Press	(3′)	130	
Large Pneumatic Riveter	(4′)		Boiler Shop (Maximum Level)
Pneumatic Chipper	(5′)		
		120	
Multiple Sand Blast Unit	(4′)		
Trumpet Auto Horn	(3′)		Jet Engine Test Control Room
Automatic Punch Press	(3′)	110	
Chipping Hammer	(3′)		Woodworking Shop
Cut-Off Saw	(2′)		Inside DC-6 Airliner
Annealing Furnace	(4′)	100	
Automatic Lathe	(3′)		Can Manufacturing Plant
Subway Train	(20′)		Inside Subway Car
Heavy Trucks	(20′)		
Train Whistles	(500′)	90	Inside Motor Bus
10-HP Outboard	(50′)		Inside Sedan in City Traffic
Small Trucks Accelerating	(30′)		
		80	
Light Trucks in City	(20′)		Office With Tabulating Machines
Autos	(20′)		Heavy Traffic (25′ to 50′)
		70	
			Average Traffic (100′)
			Accounting Office
Conversational Speech	(3′)		Large City Industrial Areas
		60	
15,000 KVA, 115 KV Transformer	(200′)		
		50	Private Business Office
			Light Traffic (100′)
			Average Residence
		40	
			Minimum Levels for Residential Areas in Large City at Night
		30	Broadcasting Studio (Speech)
			Broadcasting Studio (Music)
		20	Studio for Sound Pictures
		10	
Threshold of Hearing		0	

This table adapted from chart on p. 2, "Handbook of Noise Measurement" by Peterson, Arnold P. G., and Beranek, Lee L. Cambridge, Mass.: General Radio Co., 1956.

APPENDIX IV

AGENCY IDENTIFICATION NUMBERS
for Job Analysis

25—Alabama
26—Alaska
27—Arizona O.A.S.P.A.
28—Arkansas
29—California O.A.F.C.
30—Colorado
31—Connecticut O.A.S.P.A.
32—Delaware
33—Florida
34—Georgia
35—Idaho
36—Illinois
37—Indiana
38—Iowa
39—Kansas
40—Kentucky
41—Louisiana
42—Maine
43—Maryland
44—Massachusetts
45—Michigan O.A.F.C.
46—Minnesota O.A.S.P.A.
47—Mississippi
48—Missouri O.A.F.C.
49—Montana
50—Nebraska
51—Nevada
52—New Hampshire
53—New Jersey O.A.F.C.
54—New Mexico
55—New York
56—North Carolina O.A.F.C.
57—North Dakota
58—Ohio O.A.S.P.A.
59—Oklahoma
60—Oregon
61—Pennsylvania
62—Rhode Island
63—South Carolina
64—South Dakota
65—Tennessee
66—Texas O.A.S.P.A.
67—Utah
68—Vermont
69—Virginia
70—Washington O.A.F.C.
71—West Virginia
72—Wisconsin O.A.F.C.
73—Wyoming
74—National Office
75—District of Columbia O.A.F.C.
76—Arizona
77—California
78—Connecticut
79—District of Columbia
80—Guam
81—Hawaii
82—Michigan
83—Minnesota
84—Missouri
85—New Jersey
86—North Carolina
87—Ohio
88—Puerto Rico
89—Texas
90—Virgin Islands
91—Washington
92—Wisconsin

O.A.F.C.—Occupational analysis field center.
O.A.S.P.A.—Occupational analysis special project activity.

APPENDIX V

EMPLOYER'S NAME
XYZ Automobile Travel Association

ADDRESS
1116 Lake Drive

TELEPHONE
TR 1077

PERSON TO SEE—HOW TO REACH
Mr. S. C. Snodgrass
Assistant Manager

INDUSTRY
Automobile Owner's Association

CODE
8699

SUMMARY OF JOB

Handles, in person or by telephone, requests for services and information.
Secures auto tags, dispatches servicemen to stalled cars, explains travel routes, dispenses travel literature and sells items of special interest such as theater and sporting event tickets, and travel books. Directs members with complaints or special problems to association officials, exercising tact when dealing with angry or excited customers. Suggests purchase of Association auto insurance. Speaks Spanish when necessary. Keeps records of cash receipts and number and type of services rendered. Performs related clerical duties such as typing and maintaining files of membership cards, billiig customers, and mailing travel literature.

OCCUPATIONAL TITLE
CLERK, GENERAL OFFICE

CODE
1-05.01

EMPLOYER'S JOB TITLE—DEPARTMENT
Reception Clerk

CODE

HOURS OF WORK
8:30 - 4:00 Monday thru Friday. Must balance cash before leaving at night

UNION

RATE OF PAY
$45.00 week

SEX
F

AGE
21-35

SKILLS, KNOWLEDGE, ABILITIES

Speak Spanish fluently; change rapidly from one task to another; Exercise judgment in determining sequence of activities to meet constantly changing situations; Deals tactfully with angry and excited customers; memorize numerous details (read conditions, routings, etc.); Keeps simple records; Type—rapid speed not essential; Read maps.

EXPERIENCE

None

EDUCATION AND TRAINING

Prefers high school or business school graduate who has had typing training.

DATE
4/23/65

PREPARED BY
James Lee

APPROVED BY
H. C. Sinclair

USES-541 (2-45) BUDGET BUREAU AFPROVAL NO. 44-R582.4 **JOB SPECIFICATION FORM**

DEPARTMENT OF LABOR
UNITED STATES EMPLOYMENT SERVICE

PHYSICAL ACTIVITIES

... 1. Walking
... 2. Jumping
... 3. Running
... 4. Balancing
... 5. Climbing
... 6. Crawling
... 7. Standing
... 8. Turning
... 9. Stooping
...10. Crouching
...11. Kneeling
.X 12. Sitting
X 13. Reaching
...14. Lifting
...15. Carrying

...16. Throwing
X 17. Pushing
X 18. Pulling
...19. Handling
.X 20. Fingering
...21. Feeling
.X 22. Talking
.X 23. Hearing
X 24. Seeing
...25. Color vision
...26. Depth perception
...27. Working speed
...28. ....
...29. ....
...30. ....

WORKING CONDITIONS

.X 51. Inside
...52. Outside
...53. Hot
...54. Cold
...55. Sudden temperature changes
...56. Humid
...57. Dry
...58. Wet
...59. Dusty
...60. Dirty
...61. Odors
...62. Noisy
...63. Adequate lighting
...64. Adequate ventilation
...65. Vibration

...66. Mechanical hazards
...67. Moving objects
...68. Cramped quarters
...69. High places
...70. Exposure to burns
...71. Electrical hazards
...72. Explosives
...73. Radiant energy
...74. Toxic conditions
X 75. Working with others
...76. Working around others
...77. Working alone
...78. ....
...79. ....
...80. ....

MISCELLANEOUS COMMENTS

Must be courteous, tactful, and possess a pleasing appearance and voice.

REFERENCE MATERIALS

JD - Office Occupations - page 86
Hotel and Restaurant - page 271
Retail Trades - Vol. I, page 11

TESTS

U. S. GOVERNMENT PRINTING OFFICE 383167

DETAILS OF PHYSICAL ACTIVITIES

Sits at desk throughout work period. Talks to members in person or by telephone (60%). Handles forms, cards, cash, maps, pamphlets(30%) Uses fingers to write and type (20%). Occasionally opens and closes desk drawers, exerting 10-15 lbs. pressure with either hand, and reaches for forms and supplies.

DETAILS OF WORKING CONDITIONS AND HAZARDS

Works with others in quite, well-lighted and ventilated office.

OTHER SOURCES OF WORKERS

Information Clerk	- 1-18.62
Appointment Clerk	- 1-18.41
Receptionist	- 1-18.43
Call Clerk	- 1-18.47
General Clerk	- 1-04.01
Adjustment Clerk	- 1-12.31

APPENDIX VI

Budget Bureau
No. 44–R7224

CONFIDENTIAL
STAFFING SCHEDULE
and
JOB ANALYSIS PLANNING REPORT

OCCUPATIONAL ANALYSIS

Number of Title Sheets attached 5
Signature John White Date 5/16/64
Establishment No. 99–350–15

Number of Employees 350
Industry (DICTIONARY OF OCCUPATIONAL TITLES) Name Textile

Products Manufactured or Services Rendered: This establishment is engaged in the manufacture of thread for sewing, crocheting, embroidering, knitting, and hand weaving. In the "manufacturing" division, processes are typical of the cotton textile industry. Departments included in manufacturing are carding, spinning, single winding, doubling, twisting, ply winding, reeling, and warping. After reeling or warping, yarn is sent to a processor for mercerizing, dyeing, or bleaching. The "finish winding" division includes the departments listed on the attached schedules, and there the processed thread is wound, wrapped, labeled, and boxed for retailing. Some skein winding is done in the shipping department.

REMARKS Only those jobs unique to thread manufacturing were studied.

In No. (line number) column number lines by departments

To be entered on Title Sheets In Inex. (inexperienced) column X—No experience required

In Tr (treatment) column
O—No action
A—Complete schedule to be written
V—existing data to be verified

OCCUPATION ANALYSIS

Confidential Staffing Schedule and Job Analysis Planning Report

Title Sheet No.: 2/5

Department: Spool Winding

Number of Employees in Department: 55

No.	Plant Title	Code	Inex.	No. Employed			Dictionary Title	Code	Tr.	Comments
				M	F	T				
1	Section Man			AM 1 PM 1		1 1	MACHINE FIXER (textile)	5–83. 324	A	JAS 9900312
2	Service Man Fixer		X	AM 2 PM 2		2 2	LABELING-MACHINE SET-UP MAN (textile)	7–83. 312	A	JAS 9900313
3	Floss Winder		X		1	1		6–19.	A	See narrative report JAS 9900314
4	Spool Winder		X	AM PM 1	15 14	15 15		6–19.	A	See narrative report JAS 9900315
5	Labeler		X	AM PM	6 6	6 6	LABELER, MACHINE (any ind.) II	7–68. 214	A	JAS 9900316
6	Service Laborer		X	AM 2 PM 2		2 2			O	Not included in assignment.
7	Box Stamper		X	2		2	BOX PRINTER (any ind.)	7–68. 212	A	JAS 9900317

Enter any additional comments on reverse side.

Budget Bureau Approval No. 44–R7224

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